

# F-5

## in action

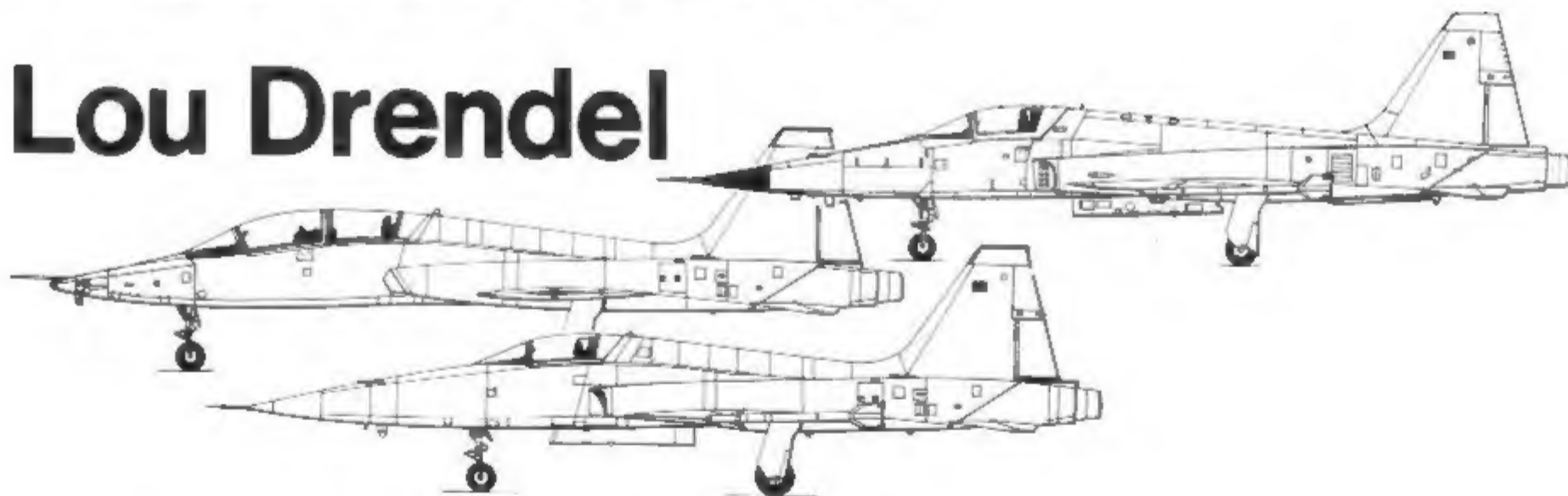


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AIRCRAFT NO. 38

# **F-5**

**in action**

**by Lou Drendel**



**squadron/signal publications**

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Three F-5As, seen during weapons evaluation flights conducted by the USAF. Other F-5As carried USAF markings but were in fact owned by the nations whose pilots were being trained in the U.S. (Northrop)







## T-38 "Talon"

Northrop had a better idea. Back in the mid-fifties, when most new fighters were growing ever larger, more complex, and more expensive, Northrop took a long, hard look at the trend and decided to go the other way. Now, twenty years later, the lightweight fighter is in vogue, and follow-on versions of Northrop's brainchild are still in production. It may never become the most prolific jet fighter in U.S. history (the Phantom and Sabre have wide leads in that department), but it may well set a production longevity mark before being supplanted by the F-18L sometime in the eighties.

The impetus for the Northrop program was provided by the considerable market for sales to allied nations under the Military Assistance Program. Most of these nations were equipped with the F-86 or F-84 early in the fifth decade of this century. Following a 1954 tour of European and Asian nations, Northrop engineers realized that most of our allies would not have the financial wherewithal to cope with the increasing cost of the Century Series and later fighters when their '86s and '84s began to wear out.

Northrop carried their cost studies beyond the overall program cost figure, breaking them down into three major categories, which included Research and Development, Procurement, and Maintenance and Operation. The last item on the list turned out to be the most expensive, considering the fighters that were then coming off the production lines and drawing boards of the U.S. Aerospace Industry.

Fortunately for Northrop, big and expensive was not the only thing coming off the drawing boards at General Electric. G.E. had developed a small, high thrust-to-weight ratio turbojet engine for use in missiles. (No Virginia, cruise missiles are not new!) The YJ-85-1 was a non-afterburning engine with 2,100 lbs. of thrust, and it was available immediately. The dash five version of the J-85, with an afterburner, promised 3,850 lbs. of thrust and weighed in at a paltry 559 lbs.!

Northrop's project was designated N-156F, with a tandem two seat trainer version labeled N-156T. It began as a company-funded study. As the study continued to evolve, it became apparent that the N-156T might be just what the USAF had in mind when it had issued a 1955 General Operational Requirement (GOR SS-420L) for a supersonic basic trainer. In November, 1955, Northrop management gave preliminary design chief W. E. Gasich the word: Get on a specific operational design to fill the bill. The T-38's gestation period had begun.

Though the fighter version was relegated to the back burner during development of the T-38, it was never completely shelved, and when the T-38 went into production, Northrop once again turned its attention to the fighter.

When the Air Force decided that it needed a supersonic basic trainer, it was because contemporary fighter aircraft had opened a giant gap between themselves and the T-33, which was the airplane students flew before going to their assigned aircraft. Too much time was being spent teaching new fighter pilots to learn to stay ahead of their new steeds. While they should have been learning weapons delivery techniques and fighter tactics, they were learning to avoid scaring themselves silly with their newly acquired speed and power.

In addition to the basic requirements of supersonic capability, high rate of climb, high sink rate, and high altitude true airspeed navigational capability, the USAF T-38 Project Team wanted to design out some of the shortcomings of their Century Series fighters.

Their "shopping list" included the following:

- Improved audio and visual landing gear position warning system.
- A more logically planned instrument layout for IFR flight, with radio channel selectors placed on the panel, where a pilot making an instrument penetration could change channels without taking his eyes off the primary attitude instruments.
- Cockpit controls all placed ahead of the pilot's elbow.
- Improved visibility for both cockpits.
- Different sizes for hydraulic disconnect fittings, to prevent cross connections of systems.
- Staggered placement of flight control quick disconnects, which prevent cross connection of these systems.
- Redundancy of hydraulic power systems, with either engine able to supply power on its own.
- Capability to control aircraft with one aileron.
- Speed brakes.
- Emergency cross feed for fuel, and ability to feed all fuel to one engine.
- Gravity fuel feed, as a backup to boost pumps.
- Dual AC generator supplied power systems, with automatic switching to back-up if primary fails.
- Redundant hydraulic systems, capable of operating on one engine.

Many of these may seem elementary now, but in the fifties they were not standard on some of the Century Series. The T-38 Project Team had made a major study of aircraft accidents and their causes, and they were determined to give the students of the future a forgiving machine. (The safety record of the Talon is a testament to their judgement.) The adaptability of Northrop's basic design made incorporation of all of these requirements possible, and the first YT-38 was rolled out of Northrop's Hawthorne, California works on August 15th, 1958. It made its maiden flight on April 10, 1959. The first two YT-38s were powered by the dash one versions of the J-85, while the remaining four YT's had the more powerful dash fives installed. The thoroughness of Northrop's development program (more wind tunnel time than any previous aircraft) resulted in a smooth flight test program. More than 2,000 flights were conducted without a major accident, and the first T-38 was accepted by the Air Training Command in March, 1961.

Known as "The White Rocket," the T-38 is a remarkable airplane in many

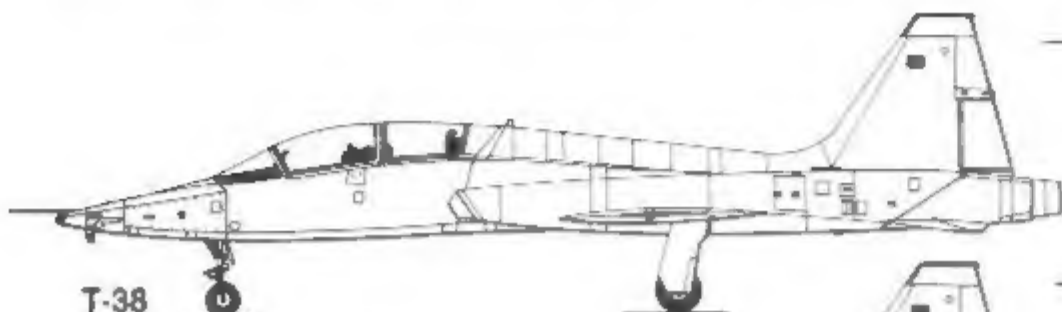
respects. It has saved U.S. taxpayers over a billion dollars in its lifetime. (\$550 million in attrition that has not occurred, as over 1,000 of the original 1,187 built are still in operation, and \$650 million in projected maintenance costs that have never materialized). In the first ten years of its production, while the rest of the U.S. economy suffered from inflation, the per unit cost of the T-38 declined every year until it was half of the original. (Some of this must be attributed to Northrop management, as the T-38/F-5 program manhours required to produce a pound of aircraft hardware was 20 percent better than the aerospace industry average.)

The Talon has celebrated its twentieth anniversary, with no challenger for its job on the horizon. It has trained over 40,000 pilots, and has the best safety record of any type in the inventory. (Its 2.2 accidents per 100,000 flying hours is five times less than that for Air Force fighters, and half the rate for all Air Force aircraft.) It requires only 9 man-hours of maintenance for every 1 hour of flight time. (Contemporary fighter aircraft were all in the mid to upper twenties in that category.) It has flown over six million hours, and the USAF has never issued a fleetwide grounding order for the T-38. It was the first supersonic aircraft in U.S. service to complete its flight test program without a major accident. The basic design of the T-38 has never been changed.

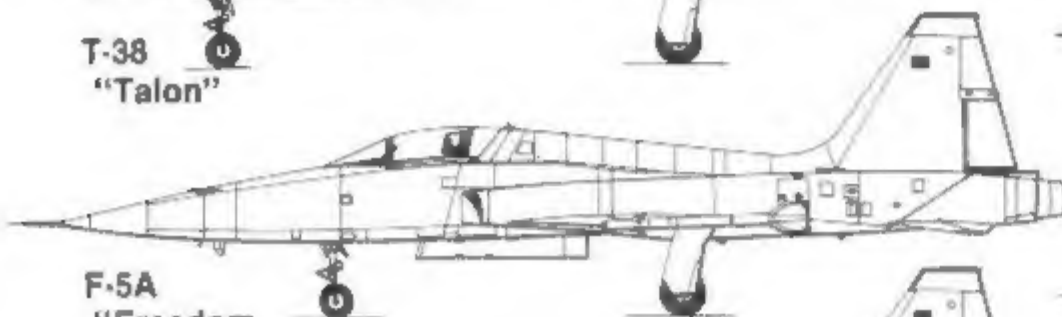


Northrop's test fleet at Edwards AFB in the early 1960s. Behind the six test T-38s are the first two prototype F-5s. "81195" has the metal baffle plate over the two exhaust nozzles, later adopted as a production feature. These aircraft also display orange high-visibility panels. (Northrop)

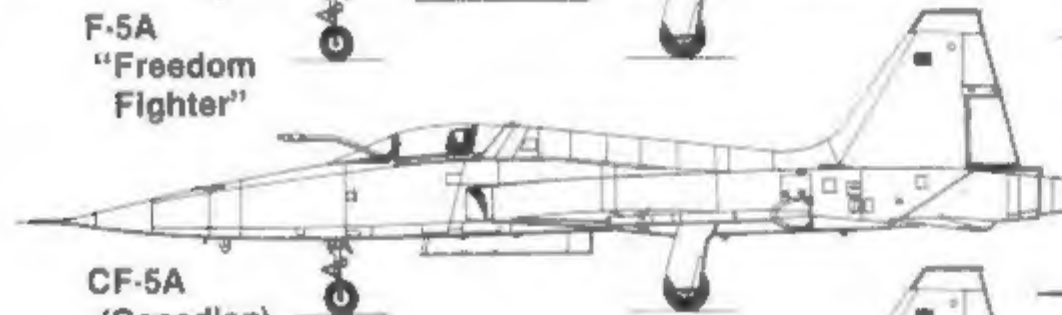
# F-5 Development



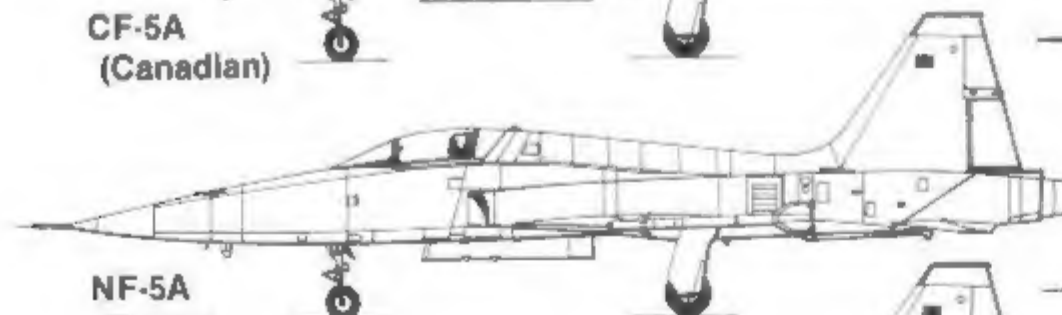
T-38  
"Talon"



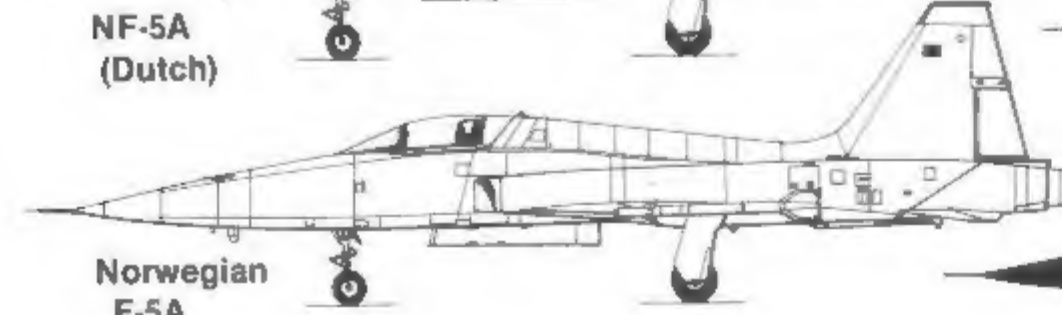
F-5A  
"Freedom  
Fighter"



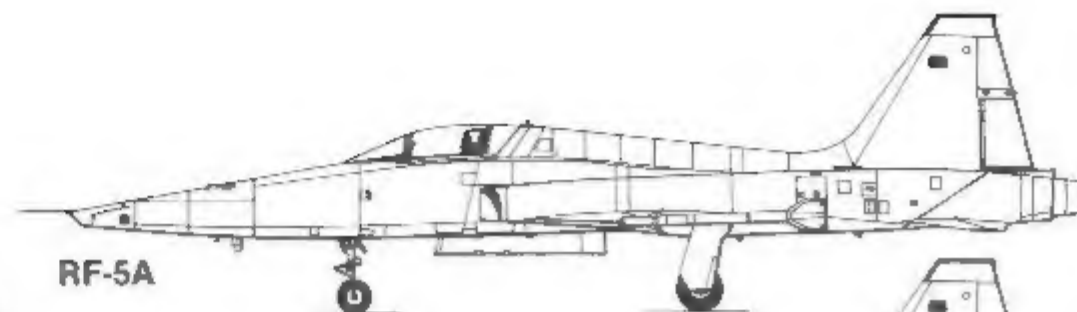
CF-5A  
(Canadian)



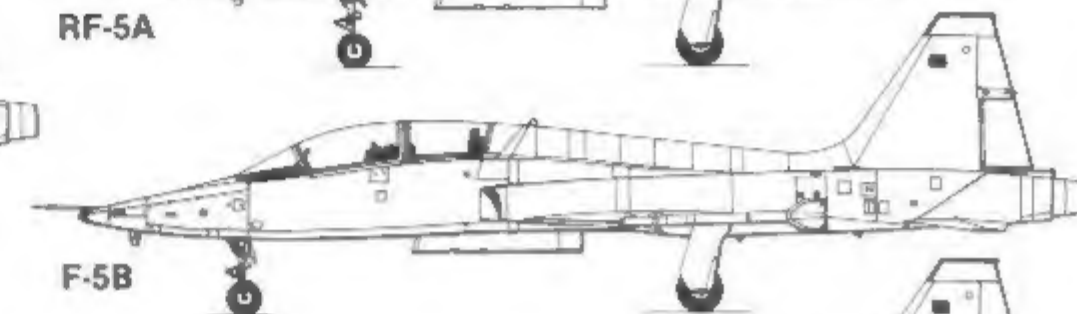
NF-5A  
(Dutch)



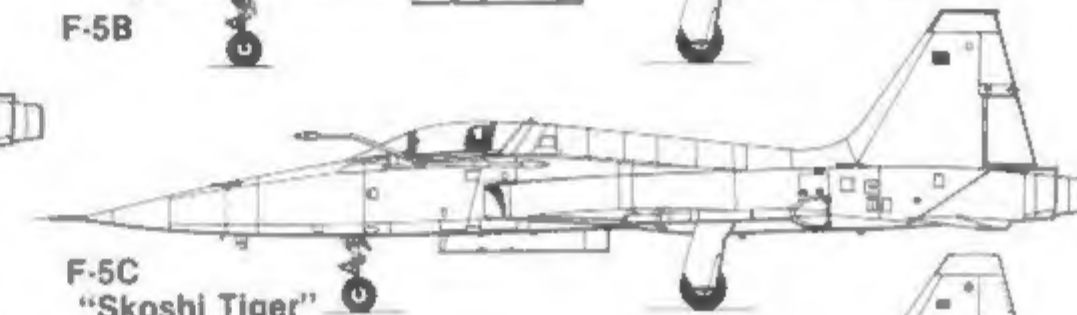
Norwegian  
F-5A



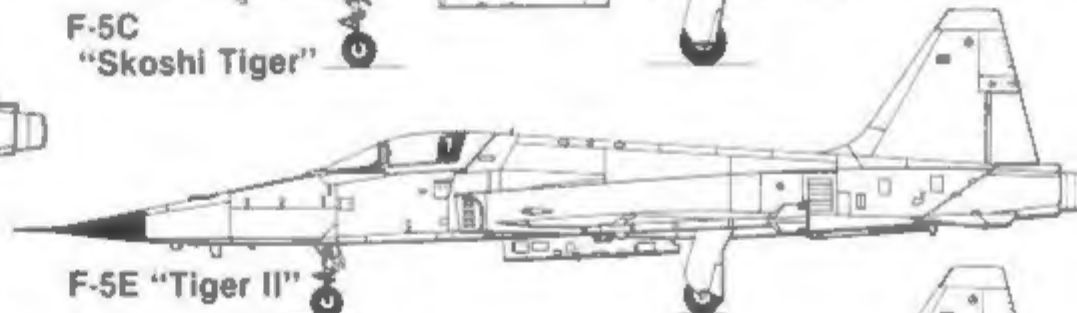
RF-5A



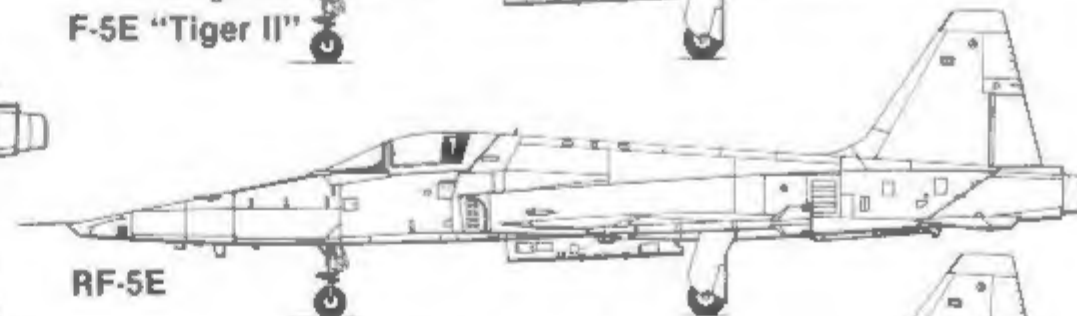
F-5B



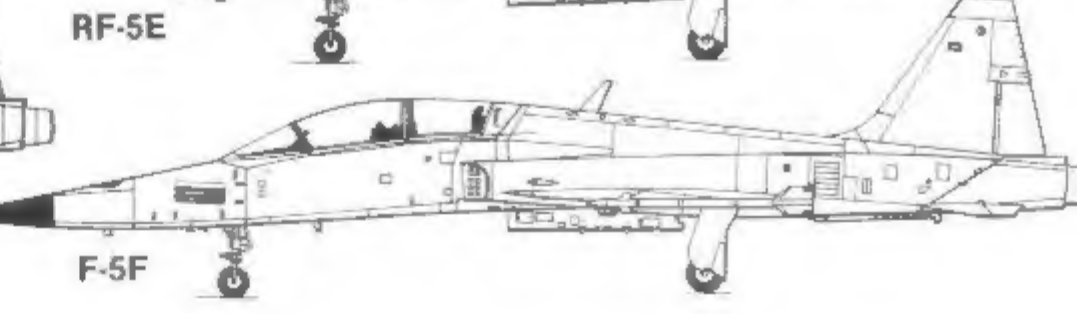
F-5C  
"Skoshi Tiger"



F-5E "Tiger II"



RF-5E



F-5F



Another view of "81194", showing the installation of the curved-section metal plate over the afterburner nozzles. Early T-38s did not have the small dorsal air scoops over the engines to cool the afterburners. (USAF)

The first T-38s joined Air Training Command in March 1961. Within a year, the T-38 set time-to-climb records for 3,000, 6,000, 19,000 and 12,000 meters. These aircraft carry the early training markings of orange high-visibility panels on wings and rear fuselage, with large "buzz" numbers. (Northrop via Taylor)



An early T-38 on a formation training flight, seen from another trainer. Note the hood pulled over the rear pilot's position, for instrument training. (Northrop)

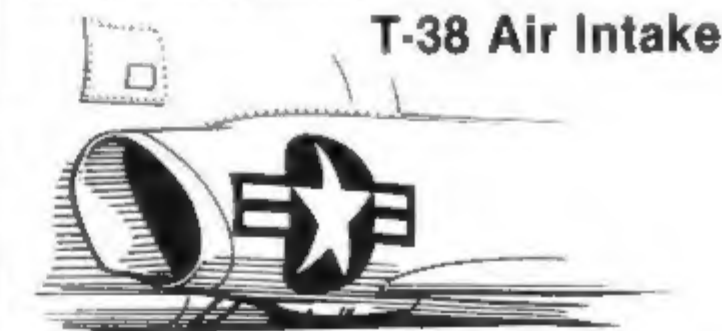




A T-38A-NO-40 of the 3560th Pilot Training Wing, Webb AFB, Texas. This aircraft, photographed in April 1965, has recently had its orange trainer high visibility panels removed-note the lighter areas on the nose and tail. The ladders were the standard means of entering the cockpits. (Norman E. Taylor)



A T-38A-NO-5 of the San Antonio AMA at Kelly AFB, Texas. As part of the Air Materiel Command, this T-38 retains the orange color panels which were removed from Talons assigned to the Air Training Command. (Norman E. Taylor)



A T-38A-NO-50 at ATC at Kelly AFB, Texas, October 1971. The ejection seats are rocket powered, and are not sequenced. The instructor's seat is 10 inches higher than the students, affording excellent forward visibility. Note the WW2-style insignia on the fuselage. (Norman E. Taylor)

# T-38A "Talon"

## Dimensions:

Wing span  
Length overall  
Height overall

25 feet, 3 inches  
46 feet, 4 1/4 inches  
11 feet, 10 1/2 inches

## Weights:

Max. take-off and landing  
Max. zero fuel weight  
Max. wing loading  
Max. power loading

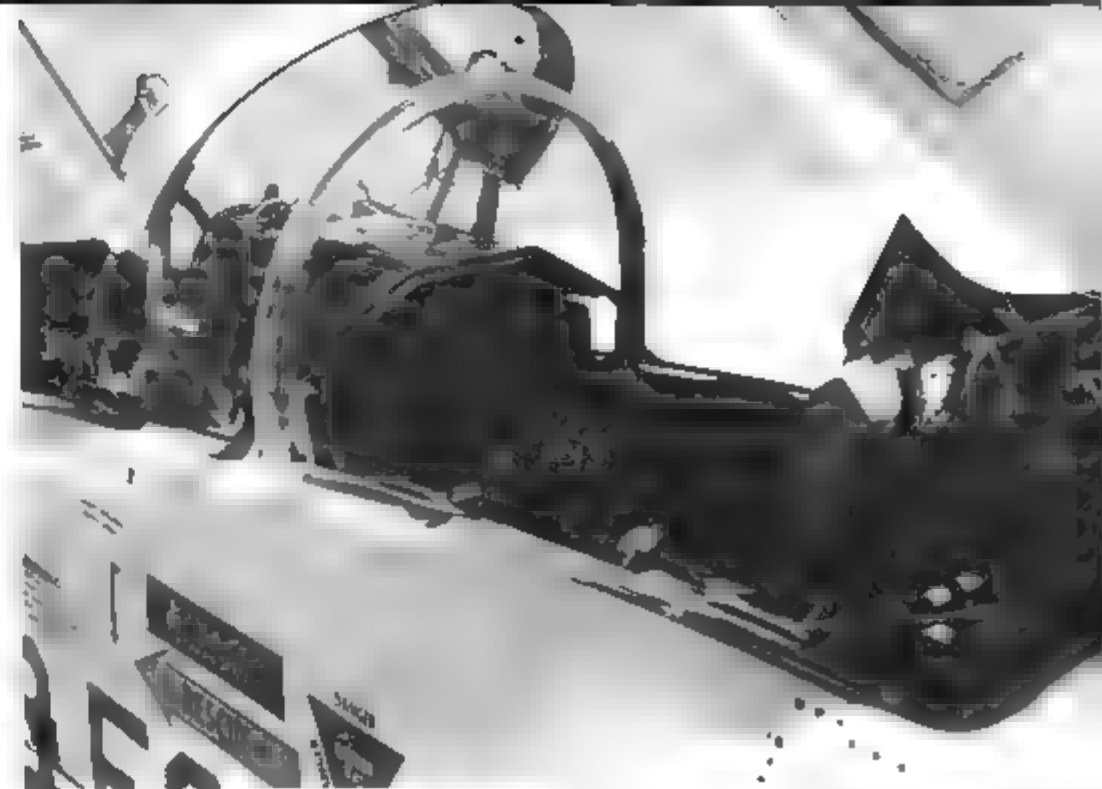
11,620 lbs.  
7,470 lbs.  
69.5 lbs. per square foot  
1.54 lbs. per lb. static thrust

Performance: (at max. take-off weight, except as noted.)

Max. level speed at 36,000 feet  
Max. single engine speed  
Max. permissible diving speed  
Stall speed @ 9,000 lbs.

Mach 1.3  
Mach .095  
817 mph IAS  
116 knots





Production was at its zenith when this 1967 picture was taken at Northrop's Palmdale facility. Over 900 T-38s had been delivered, and a follow-on contract for additional aircraft, to the tune of \$3.5 million dollars, had just been received. (Northrop)

The T-38 cockpit layout includes a windscreen between the front and rear cockpits to protect the rear seater in the event the front seater should happen to lose his canopy, or eject first in an emergency. (Northrop)

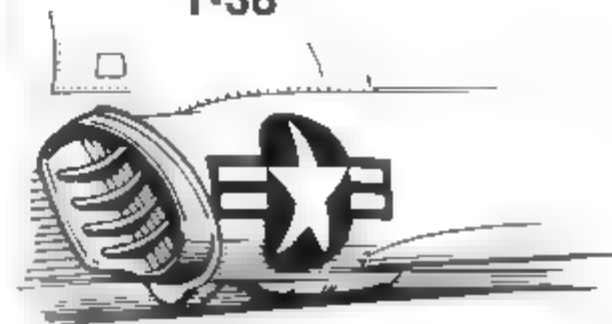
A T-38A, NO-85 at Kelly AFB, Texas, December 1972. Chances are the pod on the centerline is not some kind of exotic weaponry, but a luggage carrier for cross-country flights. (Norman E. Taylor)

NASA has used the T-38 primarily as fast transportation for astronauts to commute between Cape Canaveral, Houston, and various contractors around the country. It has also been used as a "space-flight readiness trainer" (translation: toy for astronauts to play with before space flights, thereby aiding in the sedation of pre-space flight butterflies). (Jerry Greer)

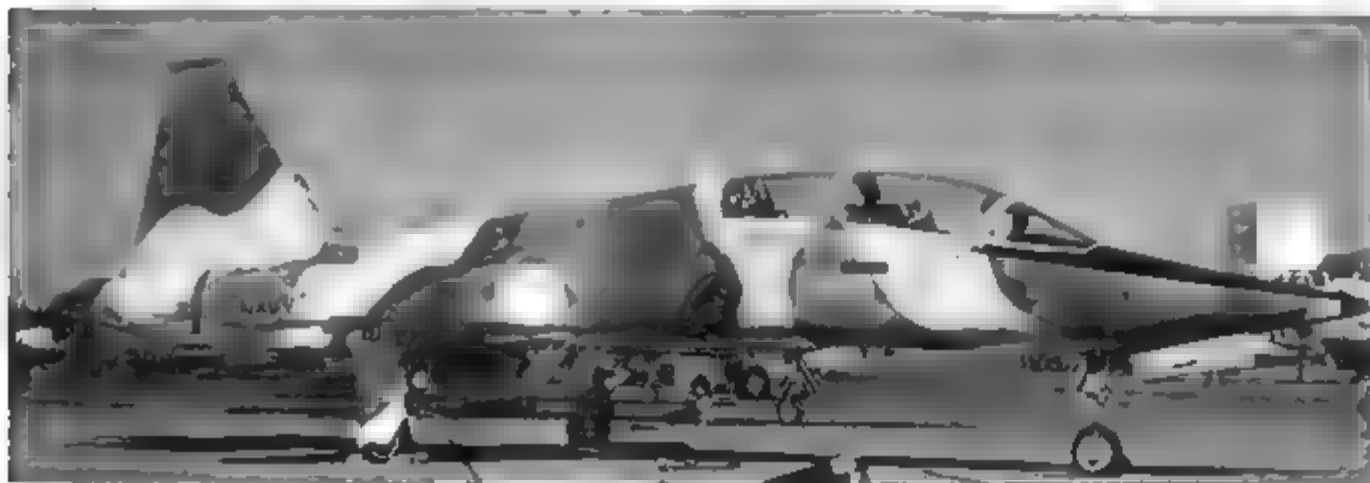


China Lake's bicentennial bird was one of the more esthetically pleasing red, white and blue celebrants of 1976. (Don Logan)

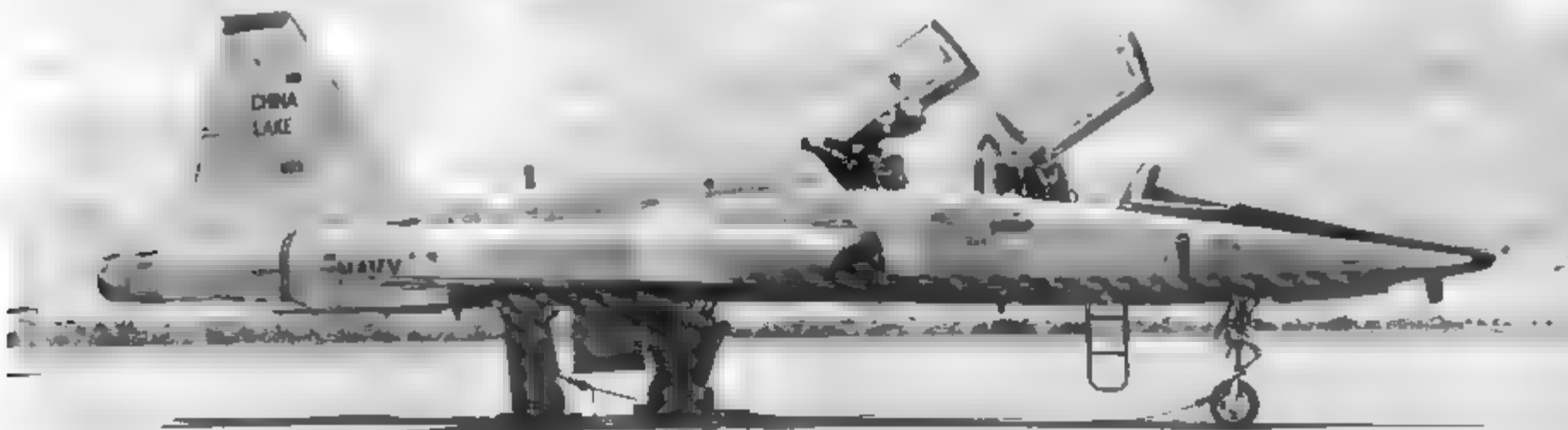
## Engine Intake Cover T-38



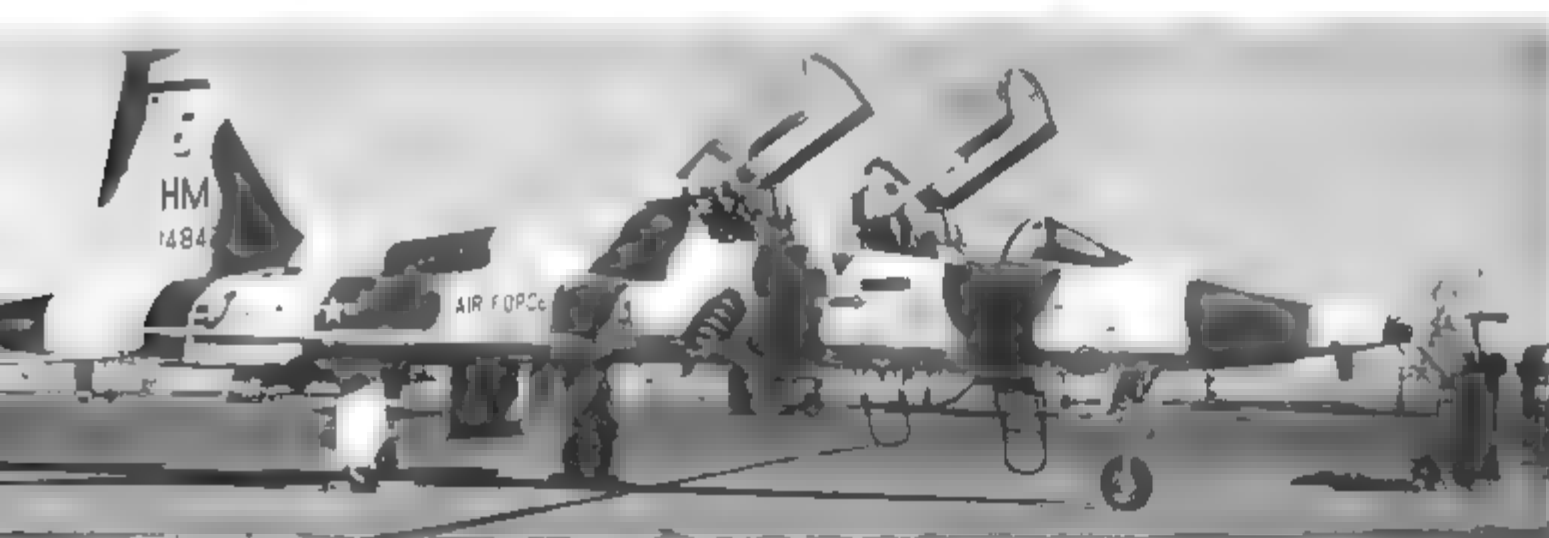
This T38A is assigned to the Navy's Fighter Weapons School ("Top Gun"), Miramar NAS. The camouflage scheme, also used by USAF Aggressor T38s, is known as "grape" and is light blue, dark blue and dark blue-gray. (Don Logan)



A QT 38A assigned to the Naval Weapons Center at China Lake May 1977. Note the lowered landing gear doors and speed brakes, and the partially extended instrument training hood under the rear canopy.







The Navy "Top Gun" program at Miramar NAS is the home of the dissimilar camouflage scheme. This "Top Gun" T-38 carries an experimental splinter pattern camouflage designed by Keith Ferris, in blue and medium gray, with the "Top Gun" emblem on the fin. (Don Logan)

Another "Top Gun" Talon carries an unusual scheme of hard edged dark blue bands over a very light blue base coat. (Don Logan)

When Nellis-based Aggressors turned in their T-38s for F-5s, the Talons went to Holloman AFB. This particular example sports a new camouflage scheme of two-tone blue. (Don Logan)



A T-38 "Aggressor" belonging to the 64th Fighter Weapons Squadron at Nellis AFB, photographed in 1976. The T-38's small size, speed, maneuverability and acceleration made it a natural choice to simulate the MIG-21. (Don Logan)

SAC used the T 38 as a proficiency trainer for SR-71 pilots  
Fairchild AFB, May 1978.

## SAC Insignia



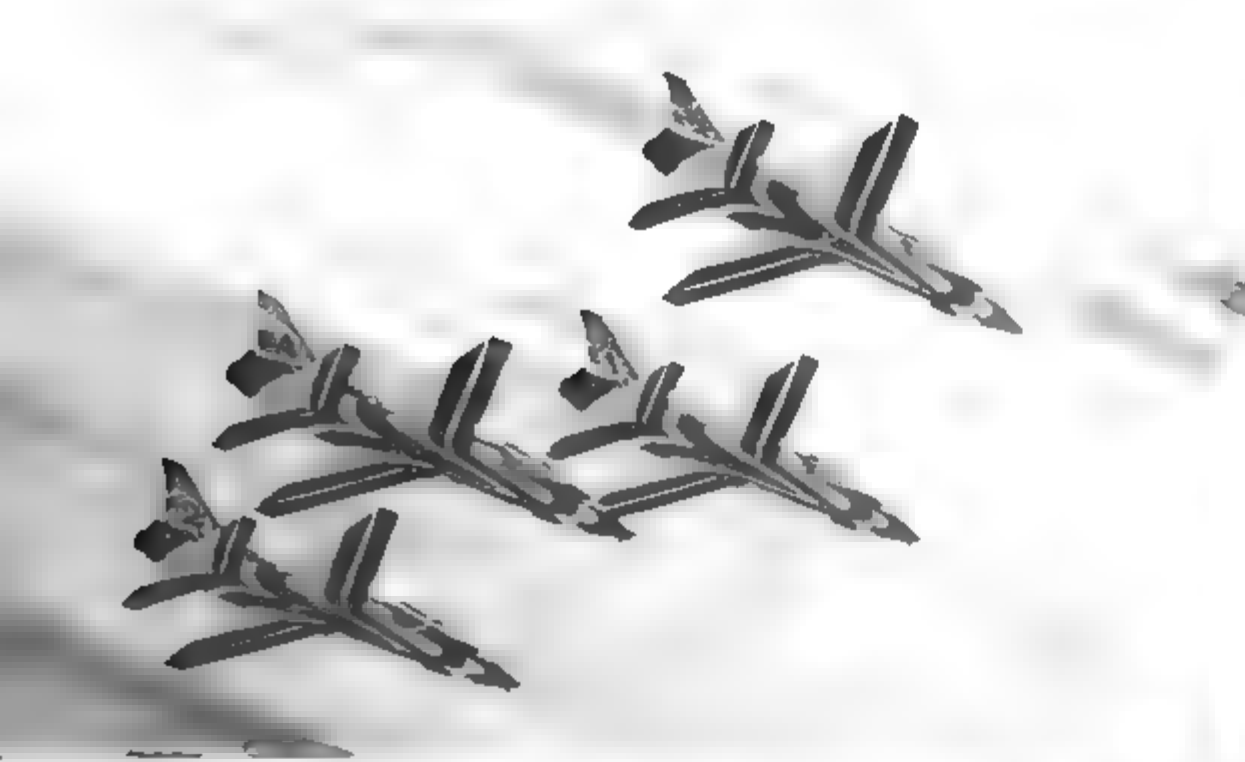
One of the 6 T 38s operated by Portugal. (J M Guhl, AIR  
FAN)



A T-38 was fitted with a weapons  
delivery hardpoint on the fuselage  
for delivery of practice bombs or  
carrying a mini-gun pod, and  
became the AT 38. (Don Logan)

# "Thunderbirds"

Perhaps the most famous squadron to fly the T 38 is the Thunderbirds Aerial Demonstration Squadron. The 1974 energy crunch provided the perfect excuse to switch from the F-4E to the T 38, since the Thunderbirds can operate 4 T 38s for the price of one F-4. The F-4 was probably the most impressive airshow airplane ever presented due to its large size and booming J-79s, but it was a maintenance headache and the safety records of both the Thunderbirds and Blue Angels suffered during the years the teams used the Phantom. The Air Force also reasons that the Thunderbirds are a recruiting tool, and it can honestly be said that any young man who sees the Thunderbirds will get to fly their airplane if he opts for USAF pilot training. (USAF)



# F-5A Fighter

The F-5 was born in a series of fits and starts. Its ancestors include a 1952 design dubbed "Fang" which bore a remarkable resemblance to the F-16; the "Tally Ho" fighter of 1954 which was the first of the line designed around the new General Electric lightweight turbojets, and a brief flirtation with a Naval Fighter designed for operation from World War II vintage "jeep" carriers. When the Navy decided to mothball its entire fleet of "jeep" carriers, Northrop began to concentrate on a design for the foreign market. The carrier fighter had been designated N-156 and this designation was retained. The Air Force selection of the N-156T to fulfill its requirement for a supersonic basic trainer put the program on the map to stay.

Northrop was gambling with its own money, and they decided to retain as much commonality as possible between the proven T-38 and its follow-on fighter cousin. Basic differences between the two included larger engine inlets to provide for additional power, extended leading edge wing roots to decrease local thickness cord ratio and reduce wave drag, leading edge wing flaps for increased lift and higher gross weights, and a drag parachute with its housing at the base of the rudder.

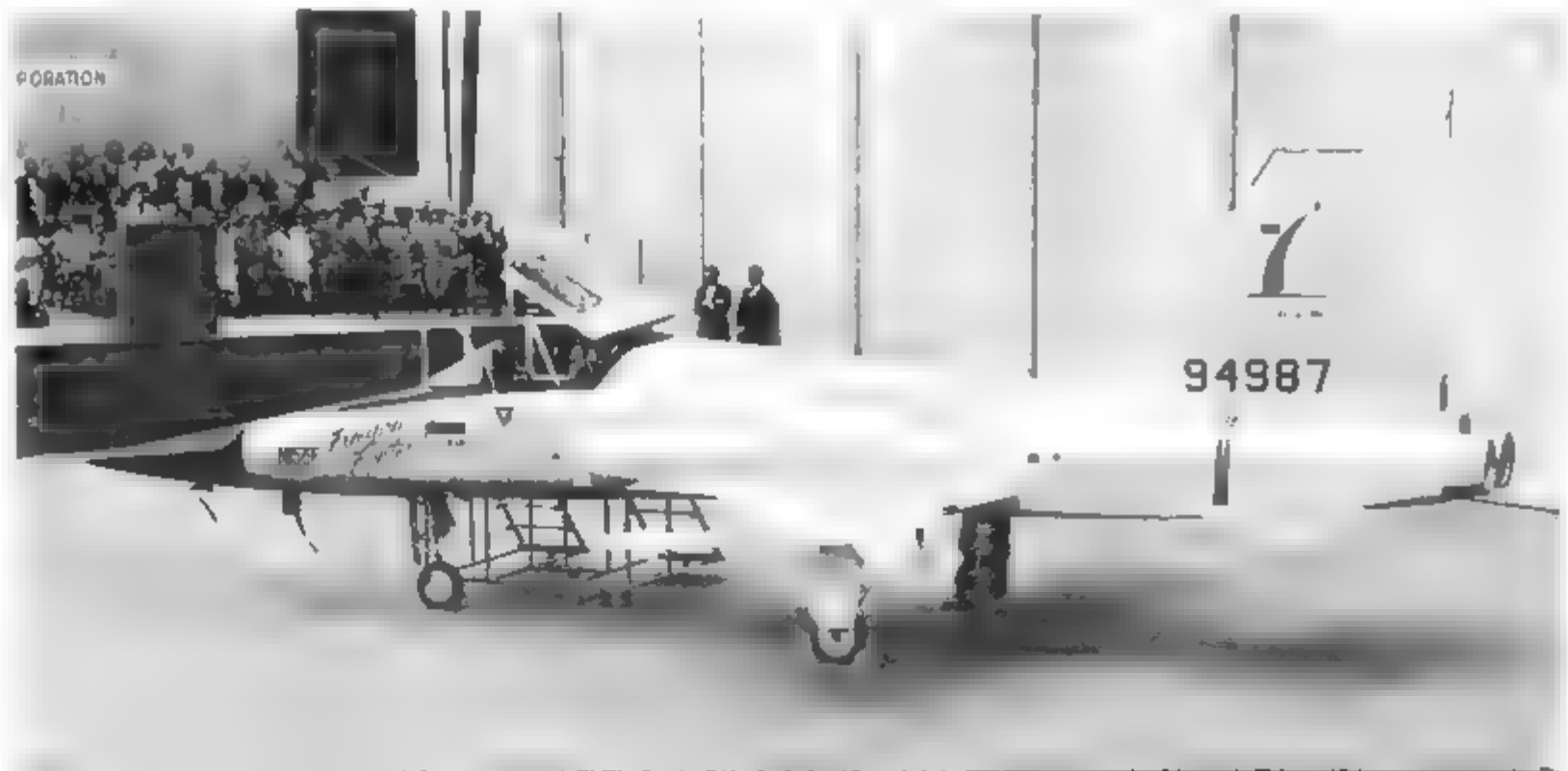
Rollout of the first F-5A, known at the time as the N-156F, occurred in May 1959. Though it was an essentially privately-funded venture, DOD allocation of \$50 million to Norair and GE for engineering development resulted in use of USAF serial numbers on the prototypes, without USAF markings! (Northrop)

The pay-off to Northrop's gamble came in 1958, when the DOD decided that a lightweight fighter might be a good thing to have for its MAP customers. A letter of intent was issued authorizing Northrop to build three prototypes of the N-156F. Northrop's decision to maintain a close relationship with the T-38 enabled them to build the prototype N-156F and test fly it at Edwards AFB by the following July. The second prototype was also completed and test flown, and the third was on the production line when the winds of change in Washington forced cancellation of the entire program.

The program languished for two years. Then, in 1962, the Kennedy Administration's desire to "pay any price" for the maintenance of freedom resulted in its resurrection. The Department of Defense announced that it had selected the N-156F to supply to our allies under the Military Assistance Program. Northrop was asked to provide a single seat version and a two seater for Iran and they were designated the F-5A and B respectively.

The initial order for the F-5A and B was for 71 As and 15 Bs, but Northrop's corporate leaders had the rights set on larger stakes than MAP customers alone.

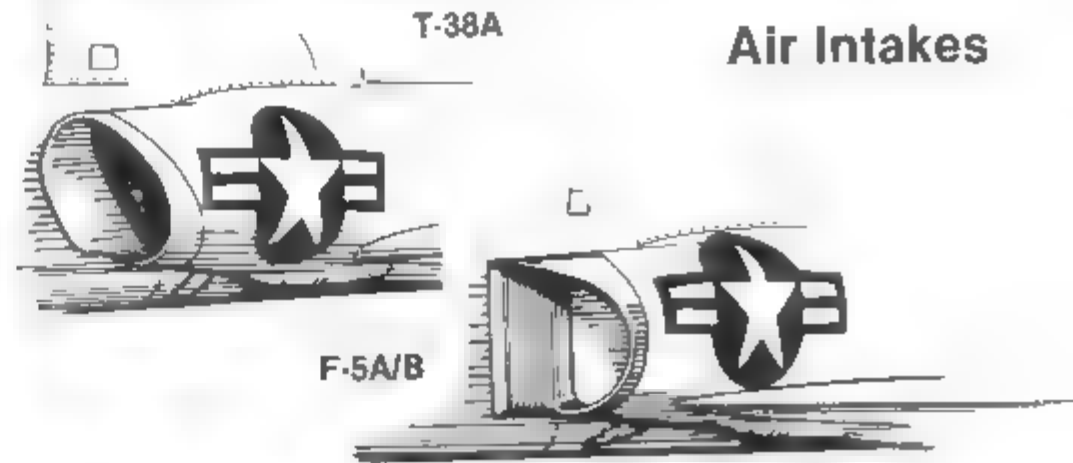
Northrop has long been somewhat of a maverick in the aerospace industry. They operate their own plants and buy their own manufacturing equipment, while many of their competitors operate out of government-owned plants. They are not pure purveyors of death and destruction, preferring to tailor their marketing plans to a potential customer's economic and political needs. This explains why some of the first customers for the F-5 (Canada, Spain, Netherlands) got the chance to build their own F-5s, providing jobs and badly needed technological know-how to local economies. This approach has contributed to the F-5's ultimate proliferation, and it has made Northrop one of the most successful corporations in American business.



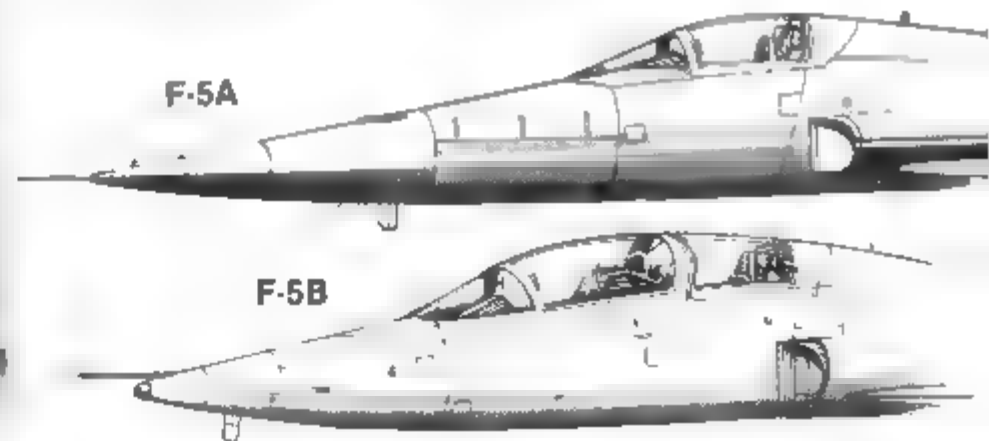




The 10th production F-5A displays its international character at Edwards AFB during weapons delivery testing. Standard armament for the F-5A includes a pair of M-39 20mm cannon in the nose with 285 rounds per gun.



The first and third F-5As make a formation landing. The basic design was so successful that company test pilot Lewis A. Heaton was able to achieve supersonic speed on the first flight (July 30, 1959), despite the fact that non-afterburning YJ85-1 engines were used. (Northrop)



## Forward Fuselage

The F-5B was developed to provide an advanced pilot trainer for combat training and periodic retraining, and also to allow the use of "trainers" as combat aircraft. Except for the deletion of the 20mm nose guns, the F-5B retains all the other weapons capabilities of the F-5A. This is the first production F-5B, with an extended nose boom and instrumentation in the rear cockpit for testing. (Northrop)

# F-5A "Freedom Fighter"

## Dimensions:

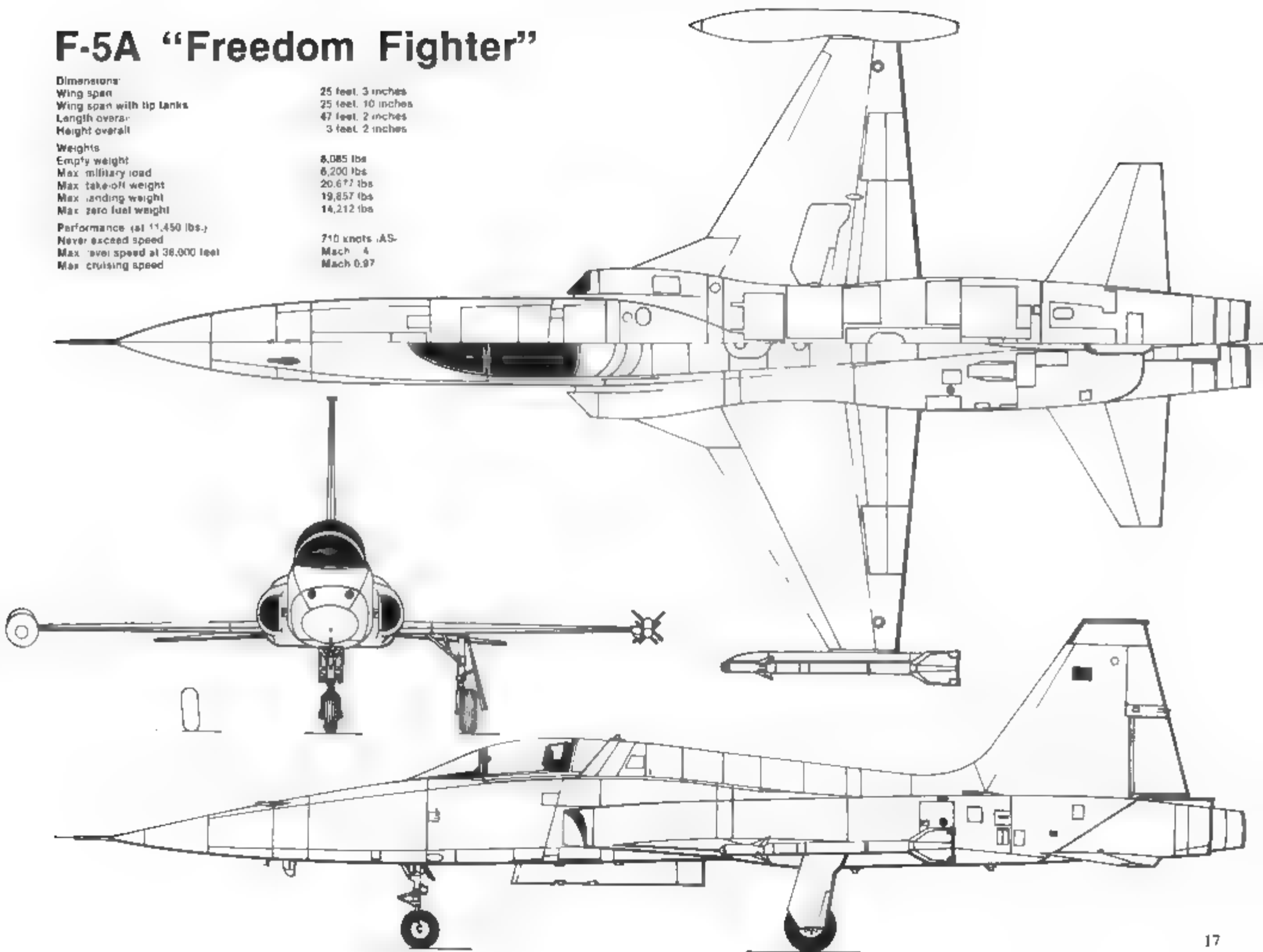
Wing span	25 feet, 3 inches
Wing span with tip tanks	25 feet, 10 inches
Length overall	47 feet, 2 inches
Height overall	3 feet, 2 inches

## Weights

Empty weight	8,085 lbs
Max military load	8,200 lbs
Max take-off weight	20,677 lbs
Max landing weight	19,857 lbs
Max zero fuel weight	14,212 lbs

## Performance (at 11,450 lbs.)

Never exceed speed	710 knots (AS)
Max level speed at 36,000 feet	Mach 4
Max cruising speed	Mach 0.97



# F-5C Operation "Skoshi Tiger", 1965

Though U.S. F-5 operations were on a decidedly low key until initiation of the Aggressor training programs, the USAF has operated the F-5 longer than any other air force. The first F-5s to come off the production lines were delivered to the 4441st Combat Crew Training Squadron, at Williams AFB, Arizona in 1964. The 4441st was assigned the task of training aircrew and maintenance personnel of the MAP recipient countries. Their first class got underway in September, 1964, and included pilots from Iran, Korea, and the U.S. Military Assistance Advisory Group (MAAG). MAAG pilots were included in the class because they would have ultimate responsibility for advising F-5 customers on how best to integrate their new fighters into existing situations.

Early class breakdown usually included at least two nationalities, though the common language was English. (All class members not fluent in the English language underwent a 15-week language training course prior to beginning the F-5 indoctrination.) Each MAP country sent 6 pilots, 50 enlisted people, and 2 officer maintenance specialists to Williams. The goal was to train these people as instructors, thereby establishing a training nucleus within their own country.

The F-5s used in this program all carried USAF markings, but were in fact owned by the countries being trained. The first F-5s actually procured for the USAF went to the 4503rd TFS, an all-volunteer group which was activated at Williams for the purpose of evaluating the F-5 in combat.

The Air Force had requested an F-5 combat evaluation, with Vietnam as the specified arena, and DOD approval for the program was granted in July 1965. Operation Skoshi Tiger was underway. Training combat indoctrination and modifications to the F-5s to be used in the evaluation were completed within three months, and on October 20, 1965 the 12 F-5s departed Williams AFB for South Vietnam. They were accompanied across the Pacific by KC-135 tankers, and after rest stops at Hickam and Anderson Air Force Bases, they arrived at Bien Hoa at noon on the 23rd. They flew their first combat mission within five hours of arrival.

Missions flown during the combat evaluation included close support, interdiction, armed reconnaissance, ground-fire-suppression escort of "Ranch Hand" defoliation aircraft, and counterair escort of electronic intelligence aircraft. They also flew MIG CAP missions in support of attack aircraft over North Vietnam. Unfortunately, they were never challenged by the Migs, and the lightweight fighter had to wait another ten years to become all the rage.

A large variety of ordnance was carried during the tests, but most missions were flown with 500 or 750 pound general purpose bombs. Combat loads averaged from 2,300 to 3,000 pounds, and were carried over a radius of 180 nautical miles unrefueled. The missions flown over Laos or North Vietnam were staged out of DaNang, and required aerial refueling.

The design goals of Northrop's engineers were verified in the four-month evaluation, as the F-5 achieved the highest operational readiness, with the lowest maintenance man hours per flight hour of any fighter in the theater. (The utilization rate was 62.5 hours per month per aircraft, with the maintenance man hours per flight hour rate pegged at 11.9 during the initial phase of the evaluation, but dropping to an amazing 6.5 in the latter half of the test. The rate had been predicted to be 21 hours before the tests began. The squadron claimed an engine change record when it accomplished an engine removal, replacement and functional flight test in one hour and fifty-five minutes, under field conditions.)

The F-5 endeared itself to its pilots, as it proved to be the least vulnerable combat jet in the war zone. It impressed controllers and the grunts with its accuracy and ease of control.

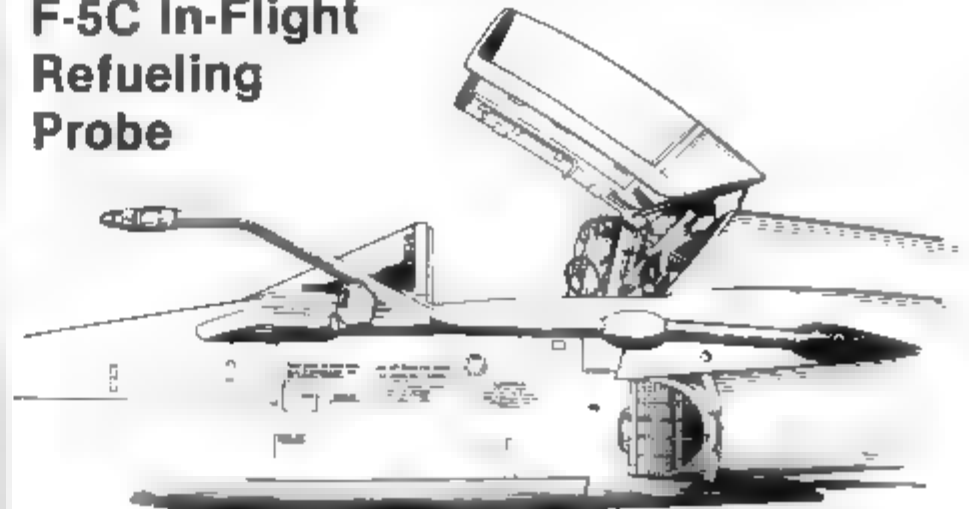
During the evaluation the F-5 flew more than 3,500 sorties, logging over 4,000 hours of combat time. Two F-5s were lost to enemy ground fire. Its outstanding performance led to Air Force study of an advanced version, which was to become the F-5E Tiger II. The F-5s used in the Skoshi Tiger program were designated C models because of the extensive modifications performed. They were turned over to the South Vietnamese Air Force upon completion of the evaluation.





An F-5A, dubbed "Exterminator", at Bien Hoa. Upon completion of the "Skoshi Tiger" evaluation, the F-5s were operated from Bien Hoa by the 10th Fighter Commando Squadron before eventually being turned over to the VNAF (Dave Menard)

## F-5C In-Flight Refueling Probe



An F-5A during the "Skoshi Tiger" evaluation. Installation of the refueling probe is an indication that this mission was to be flown over Laos or North Vietnam. (Dave Menard)

F-5s being refueled and rearmed in Bien Hoa. Standard loading for close support or interdiction missions included the 41.8 imp. gal. wingtip fuel tanks, which were replaced by Sidewinder AAMs on MIGCAP missions over the North. (USAF)







The first overseas deliveries of the F-5A were to the Imperial Iranian Air Force beginning in January 1965 with 11 F-5As and 2 F-8s. They went to Mehrabad AB. A USAF Mobile Training Team was already in place to assist Iranian instructor pilots, fresh from their check out at Williams AFB. In checking out squadron pilots. The first IIAF squadron was combat ready by June of 1965, after 900 hours of flying time. (Michel C. Kiever)



All IIAF F-5s were eventually camouflaged in what has become the typical desert camouflage scheme for F-5s. Iran bought a total of 104 F-5As, all of which were later transferred to Greece, Jordan, and Vietnam. They also bought 23 F-5Bs. (Michel C. Kiever)

## Foreign F-5As



China received some of its F-5s through the U.S. Military Assistance Program, and purchased the rest with its own funds through the U.S. Foreign Military Sales Program. (Northrop)

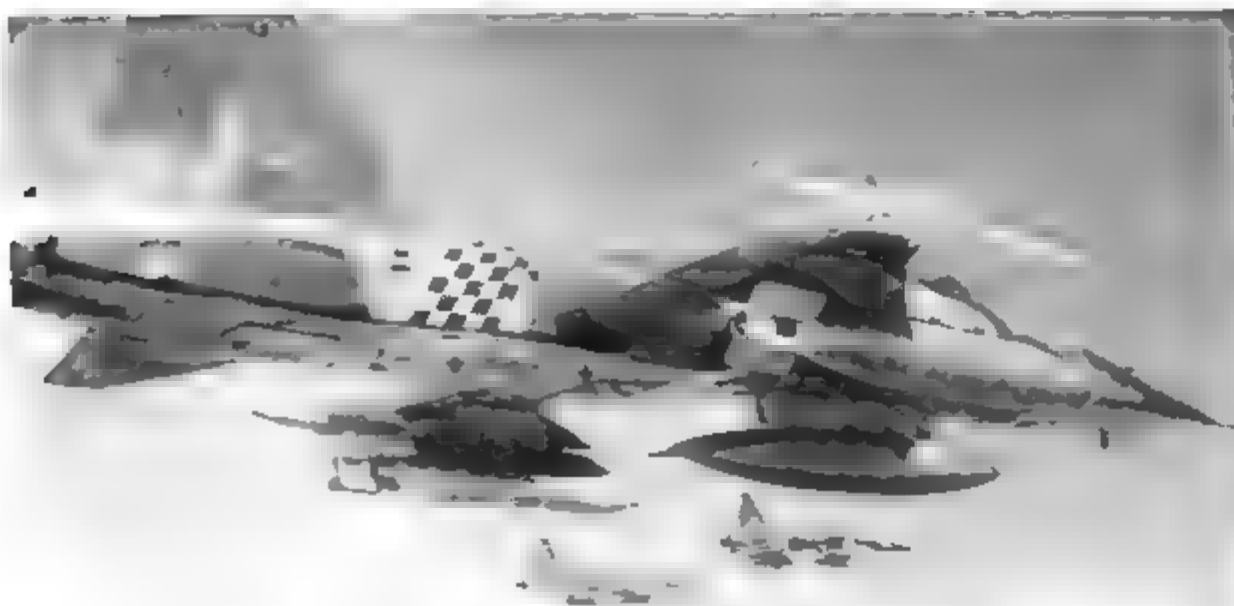


An ROKAF F-5A in three tone USAF camouflage. An unusual feature of this aircraft is the black nose, which would seem to indicate the presence of a radar when the F-5A did not have radar. (Eugene Zorn via Douglas Slowiak)

A colorful F-5A of the South Korean "Black Eagles" aerobatic team, Suwon AB. Colors are red nose with blue band, white fuselage with natural metal spine, orange band on side, white tail (gray fin cap), with black design (same design on stabilizers), natural metal wings with red tip tanks. (S. Miller via Menard)

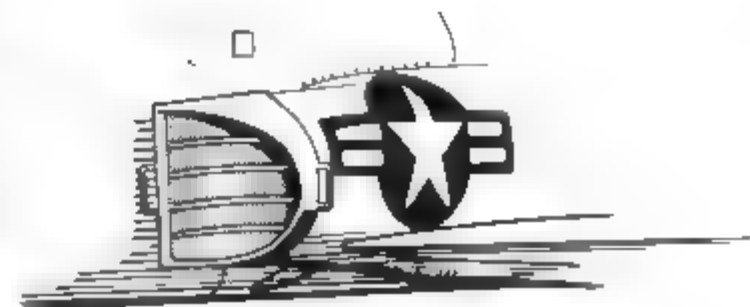
Deliveries of Korean F-5s began in April 1965, with 16 "A"s and 4 "B"s to equip the 105th Fighter Squadron of the 10th Wing at Suwon AB. 14 more "A"s were then delivered to the same base to equip the 102nd Squadron. The first unit was combat ready by September, and the ROKAF achieved a 70 per cent operational readiness rate at that time. ROKAF eventually received a total of 87 F-5As and 35 F-5Bs. (Northrop)

An F-5C of the VNAF 522nd FS, at Bien Hoa, September 1969. The fuselage band is a yellow and black checker (USAF via Norman E Taylor)



The first VNAF F-5 Squadron was officially activated at Bien Hoa on April 17, 1967. It was the 522nd Squadron of the 23rd wing, and it had received its 17 F-5As and 2 F-5Bs from the 10th FCS of the USAF. By the time the ceasefire agreements were signed in 1973, the VNAF had 35 F-5s in inventory, with agreement on the supply of 57 F-5Es. In order to build up the VNAF strength within the time limits set forth by the cease fire, 126 F-5As were leased from South Korea, China, and Iran. These were to have been returned as they were replaced in the VNAF inventory by the F-5E. This brought VNAF F-5 squadrons up to 8, from the previous 1. The first F-5Es for the VNAF were delivered in March 1974. A total of 75 F-5Es were delivered before cuts in the Vietnamese aid budget stopped further deliveries. When South Vietnam fell to the North, 3 F-5As, 1 RF-5A, 1 F-5B, and 22 F-5Es were flown out to Thailand. A total of 87 F-5s were abandoned to the victorious North Vietnamese.

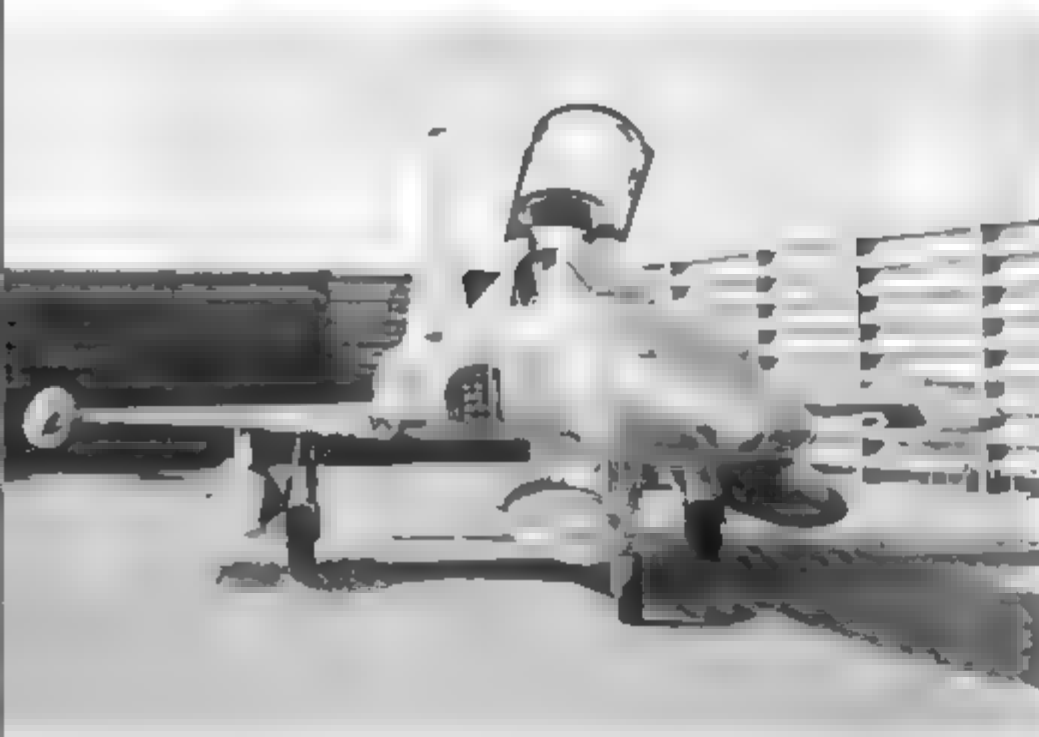
## Engine Intake Cover



An F-5C of the 522nd being pushed into its revetment, post mission, March 1970. (USAF)



A Vietnamese F-5B parked in a blast shelter at Bien Hoa Air Base. These "hardened" shelters were designed to absorb blast and fragments from mortar and artillery rounds fired into the air base by Viet Cong Insurgents. (USAF)



An RF-5A of the South Vietnamese Air Force at Bien Hoa Air Base, November 1970. (USAF)

This VNAF pilot flew his F-5 50 miles back to base on one engine after being hit by a "Strela" SAM on a mission over South Vietnam. (USAF)







The Philippines Air Force received the first of its 19 F-5As and 3 F-5Bs in early 1966. "HARI TUPAS" of the 8th TFS, and "LIGHTNING" are illustrated at left and above. (Don Logan and William Schell via Doug Slowiak)



The Turkish Air Force received 95 F-5As and 13 F-5Bs, the first deliveries being made in 1965 to the 1st and 3rd Tactical Air Forces. (Northrop)



### Wing Tip 'Area Rule' Tank

An F-5B of the Royal Thai Air Force's 13th Squadron, 1st Wing at Don Muang AB, 1967. Thailand received its first F-5s as part of a reciprocal arrangement that sent Thai troops to fight in the Vietnam War. Their F-5As were flown by 13th Squadron, while RF-5As were flown by 11th Squadron. (Norman E. Taylor)



F-5B of the 425th TFTS,  
58th TFTW, Williams  
AFB, Arizona.



F-5B of the Royal Canadian  
Air Force, 1978, in  
"Aggressor" camouflage  
applied to some Cana-  
dian F-5s for air-to-air  
combat training.



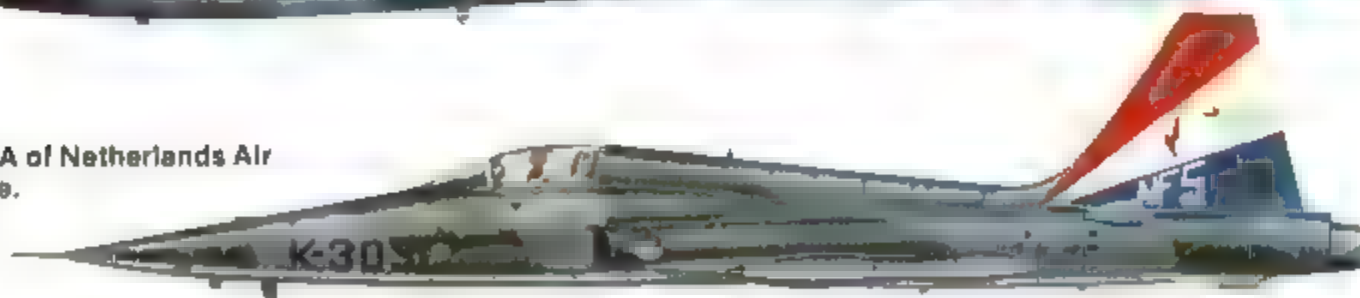
F-5E of the 64th FITS,  
57th FW, Nellis AFB,  
Arizona, in "Lizard"  
camouflage.



F-5F of the U.S. Navy  
Fighter Weapons School  
"Top Gun", Miramar  
NAS.



NF-5A of Netherlands Air  
Force.



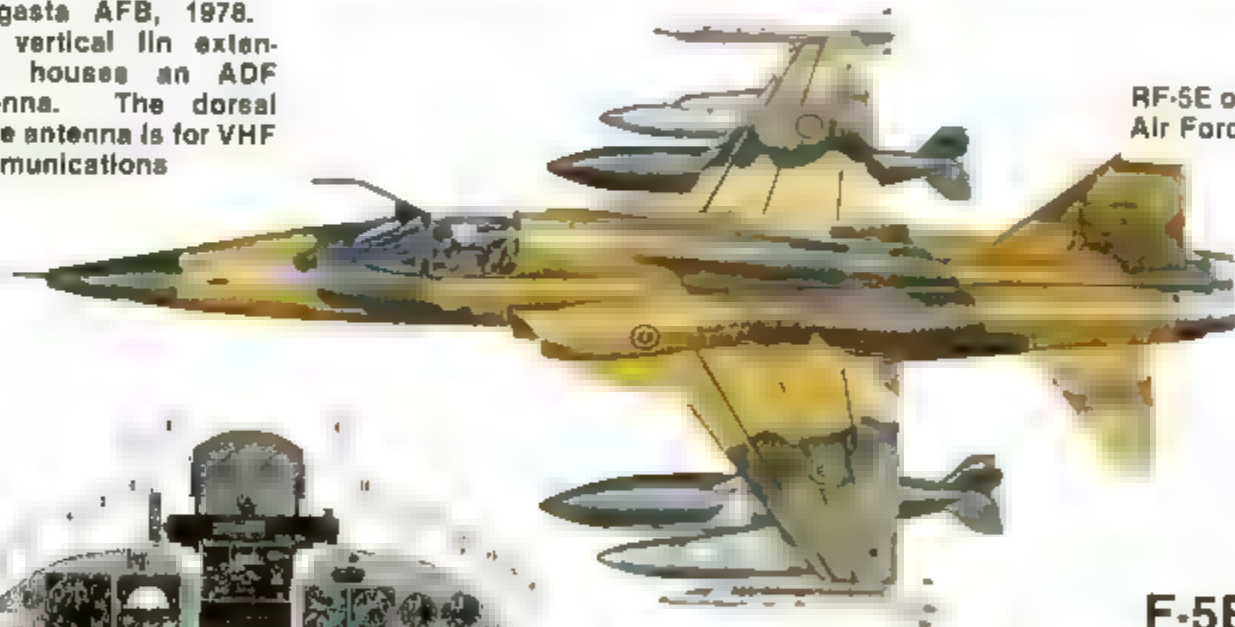
F-5A of the 522nd FS,  
23rd Tactical Wing,  
Republic of Vietnam Air  
Force, Bien Hoa Air  
Base, RVN (South Viet-  
nam).



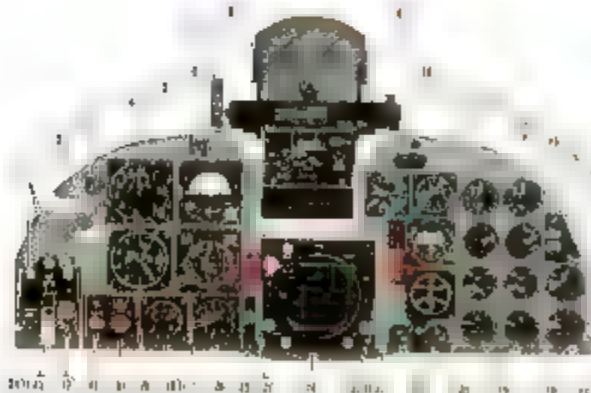
F-5A of the 1st TFW,  
Chinese Nationalist Air  
Force.



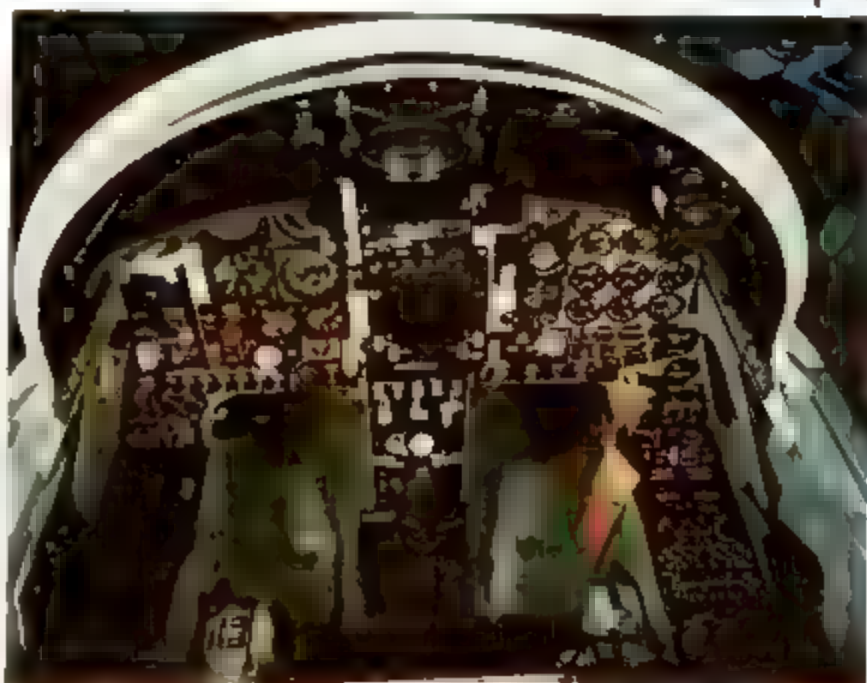
F-5E of Grupo 8, Fuerza  
Aerea de Chile, at An-  
tofagasta AFB, 1978.  
The vertical fin exten-  
sion houses an ADF  
antenna. The dorsal  
blade antenna is for VHF  
communications



RF-5E of the Royal Saudi  
Air Force



F-5E Cockpit



## F-5E Instrument Panel

- |  |  |
|--|--|
| 1 Landing Gear Position In-<br>dicator Lights      | 18 Fuel Flow Indicators                              |
| 2 Drag Chute Handle                                | 20 Cockpit Altimeter                                 |
| 3 Pitch Trim Indicator                             | 21 Hydraulic Pressure Indicators                     |
| 4 Airspeed-Mach Indicator                          | 22 Engine Compartment Fire<br>Warning Light          |
| 5 Altitude Indicator Fast-Erect<br>Switch (two NS) | 23 Master Caution Light                              |
| 6 Altitude Indicator                               | 24 Radar Indicator                                   |
| 7 Angle-of-Attack Indicator                        | 25 Navigation Mode Indicator                         |
| 8 Computing Optical Sight                          | 26 Vertical Velocity Indicator                       |
| 9 Sight Camera                                     | 27 Horizontal Situation Indicator                    |
| 10 Clock   | 28 Angle of Attack Indicator                         |
| 11 Accelerometer                                   | 29 Airmeter  |
| 12 Standby Altitude Indicator                      | 30 Arresting Hook Button                             |
| 13 Engine Tachometer Indicators                    | 31 Flap Position<br>Indicator                        |
| 14 Exhaust Gas Temperature In-<br>dicator          | 32 Landing Gear Downlock<br>Override Button          |
| 15 Auxiliary Intake Doors In-<br>dicator           | 33 Landing Gear Lever                                |
| 16 Oil Pressure Indicator (Dual)                   | 34 Landing Gear And Flap Warn-<br>ing Silence Button |
| 17 Fuel Quantity Indicator (Dual)                  |  |
| 18 Nozzle Position Indicators                      |  |



The first 8 SF 5s were assembled in Spain, from Northrop manufactured assemblies, while the balance of 36 SF 5As and 34 SF 5Bs were manufactured entirely in Spain by CASA. The first SF 5 for the Ejército del Aire Español rolled off the assembly line at Seville in June 1968, the last was completed in 1971. The Spanish Air Force has five squadrons of F-5s. They are:

731 Squadron at Talavera La Real, with SF-5B (Spanish designation C-9)

212 Squadron at Moron with SF 5Bs

732 Squadron at Talavera La Real

211 Squadron at Moron with SF 5As (C-9) and SRF 5As (CR-9)

484 Squadron at Gando (Canary Islands) with SF 5A/Bs and SRF 5As

(The designation C-9 is derived from Casa (fighter), and 9 being the 9th fighter since 1939, when the Air Force was separated from the Army) (Above left and right) An SRF 5A of 212 Squadron and an SF 5A of 211 Squadron, photographed at Cuatro Vientos 1977 (Michel C Klaver)(Left) An SF 5B of 731 Squadron (Salvador Mate Huerfias) (Below) Another SF 5B, seen during take off





F-5As of the Royal Hellenic Air Force. Achilios AB, Greece, June 1970. Greece received a total of 80 F-5As and 9 F-5Bs, some of which were transferred from the Iranian Air Force, possibly after a brief operational career in Pakistan. The first Greek F-5s were delivered in June 1965 to the 341st Fighter Squadron at Nea Anchialos. Camouflaged Greek F-5s had an unusual color scheme of green, brown, and gray with white undersides. (S. Peltz via Taylor)

An RF-5A of the 349th Squadron, Royal Hellenic Air Force, at Larissa AFB Greece during 1972 AIRSOUTH (Allied Forces Southern Europe) Fighter Weapons Meet in July 1972. The 349th Squadron took top honors in this meet, finishing ahead of US Navy and USAF teams flying A-7s and F-4s and the Turkish team, which flew the F-104G in the meet. (Geer collection)



An F-5A of 341st Squadron at Eskişehir AB, July 1971. (Geer collection)



The Libyan Air Force (Al Quwwat Aljawiyya Al Libiyya) received 8 F-5As (below) and 2 F-5Bs (right). During the time they had F-5s in their inventory they were maintained by personnel of the Hellenic Air Force. As relations with the United States deteriorated under Colonel Muammar el Gaddafi, and it became evident that the Libyans were not capable of operating the aircraft, Libya made a present of its F-5s to Pakistan. (Northrop and Michel C. Klaver)



One of 20 F-5Bs purchased by Saudi Arabia. The Saudis signed a \$130 million program agreement with the U.S. in 1971, which allowed for acquisition of equipment, spares, mobile training units and other support equipment. The F-5Bs were delivered in early 1973, and the first Es followed a year later. The first class of RSAF pilots to graduate to the F-5 did so in the summer of 1973.

Ethiopia received one Squadron of F-5As. Attrition suffered by the Ethiopian Air Force was made up by transferral of Iranian F-5As on a piecemeal basis. Despite the fact that the military junta which overthrew Emperor Haile Selassie was supplied in the main by the Soviet Union, the Carter Administration approved the sale of 6 F-5Es. In early 1977, all U.S. personnel, including the Military Assistance Advisory Group, were expelled from Ethiopia. When Ethiopia went to war with Somalia later that year, the F-5s suffered from combat attrition, and two F-5As were lost when their pilots flew them to Sudan and asked for political asylum. The government of Vietnam offered to provide spares from F-5s it had captured when the Government of South Vietnam fell in 1975.





# Canadian F-5s

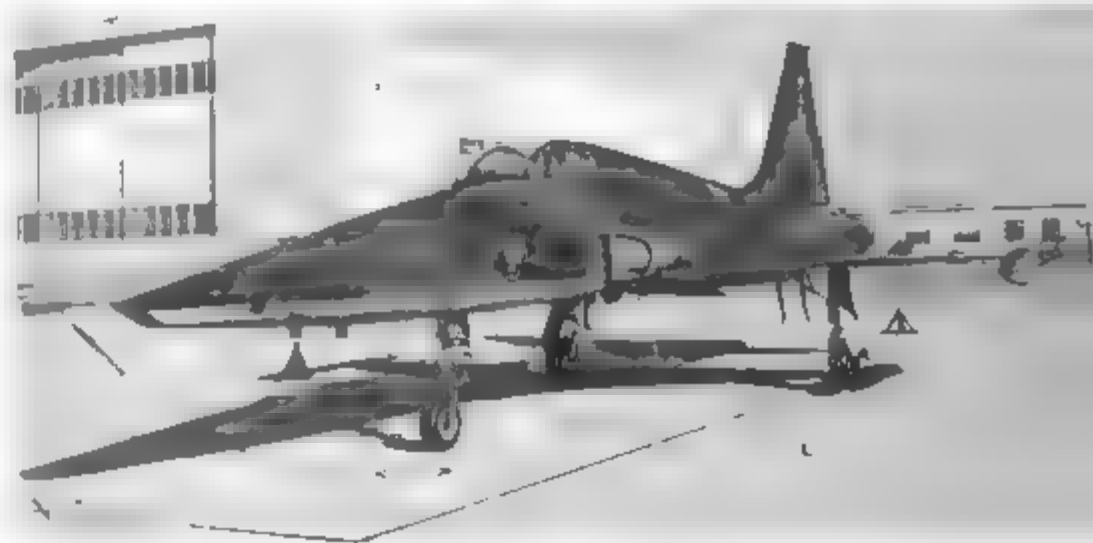
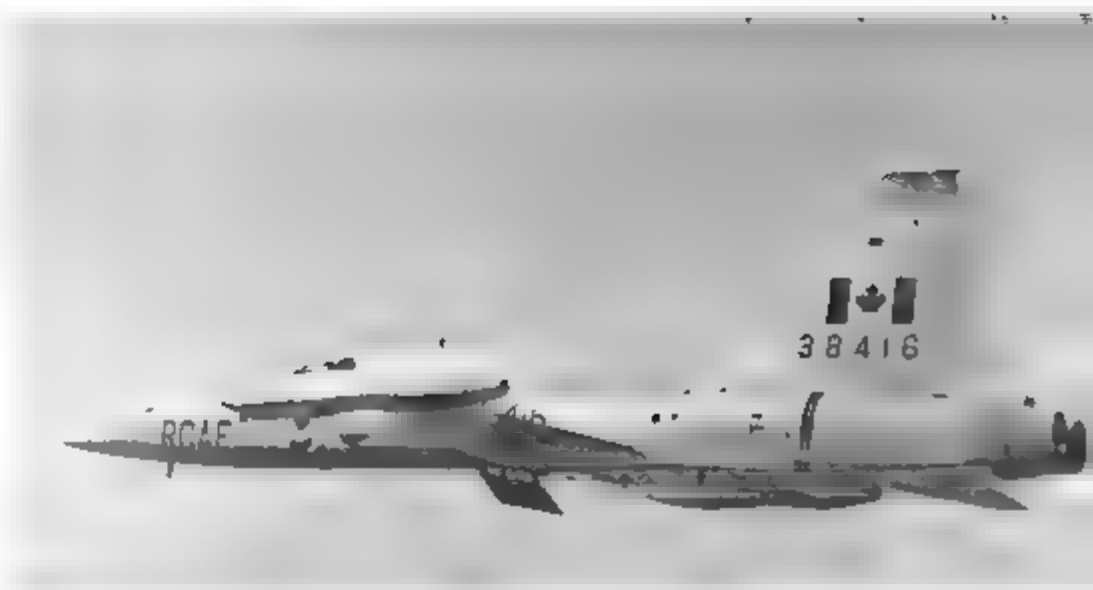
The Royal Canadian Air Force announced its selection of the F-5 for its future fighter-bomber in 1965. The initial order was for 125 airplanes, to be built under license in Canada by Canadair as the CF-5. The CF-5 was to be powered by the J-85-t5, and the estimated cost per airplane was 900,000 Canadian Dollars. As the program progressed, further additions to the basic design included the Ferranti ISIS gyro optical gunsight, two position nosewheel strut, in-flight refueling probe, and additional armor. Flight testing of the CF-5 began in 1966, and first deliveries were made the following year. Initial plans called for 6 CF-5 squadrons for the Canadian Mobile Command.

18 of the two seat versions, designated CF-5D, were ordered for the Operational Training School at Cold Lake, Alberta. By the fall of 1967, inflationary pressures had forced reduction in the original order to 110 aircraft. Further refinements to the Canadian airplanes continued, with the addition of an arrestor hook, intake anti-icing, jettisonable underwing pylons, strengthened windscreen, a lead-computing gunsight, a quick-change reconnaissance nose housing 3 70mm Vinten cameras, and an 87 percent increase in electrical generating capacity. Final production figures for the CF-5 included 89 CF-5As and 26 CF-5Ds. But by the time the production program had run its course, only 54 CF-5s were in operational service, (433 Squadron at Bagotville, and 434 Operational Training Squadron at Cold Lake) the balance of Canadian Freedom Fighters being in storage at Trenton and North Bay. The RCAF proposed keeping all of its two seaters, using them in lieu of T-33A Silver Stars in the training role, but the short range of the CF-5A was unacceptable for the vast distances involved in defending Canadian Airspace, and the Canadian government began casting about for potential customers for its 'As.

By 1971 the mission of coastal waters reconnaissance had been taken over from T-33s, and contingency plans for transfer to NATO of CF-5s in an emergency was announced. The government of Venezuela approached Canada regarding the possibility of purchase of 20 of their surplus CF-5s the same year, and by the following year had arranged for the purchase of 18 CF-5As and 2 CF-5Bs. The 'As were supplied from surplus, and the 'Bs were to be built by Canadair. The funds from this sale were used to purchase an additional 18 CF-5Ds for Number 1 Fighter Training Squadron at Cold Lake. In 1977 the Canadian government announced that all CF-5s would be relegated to the training role upon acquisition of the NFA, or New Fighter Aircraft, as it was euphemistically called since the identity of that aircraft was not then known. Target date for that event? Sometime in the eighties.

(Top) A Canadair-built CF-5A of the Royal Canadian Air Force, 1975. A 'buzz' number is on the fuselage above the wing. (Northrop) (Above right) A CF-5A-R under test at Elmendorf AFB, Alaska, May 1968. (D Kasulka via Norman E. Taylor)

A CF-5B of 434 Squadron, during a visit to Grand Forks AFB, ND December 1975 (Douglas Slowiak via Jerry Geer)



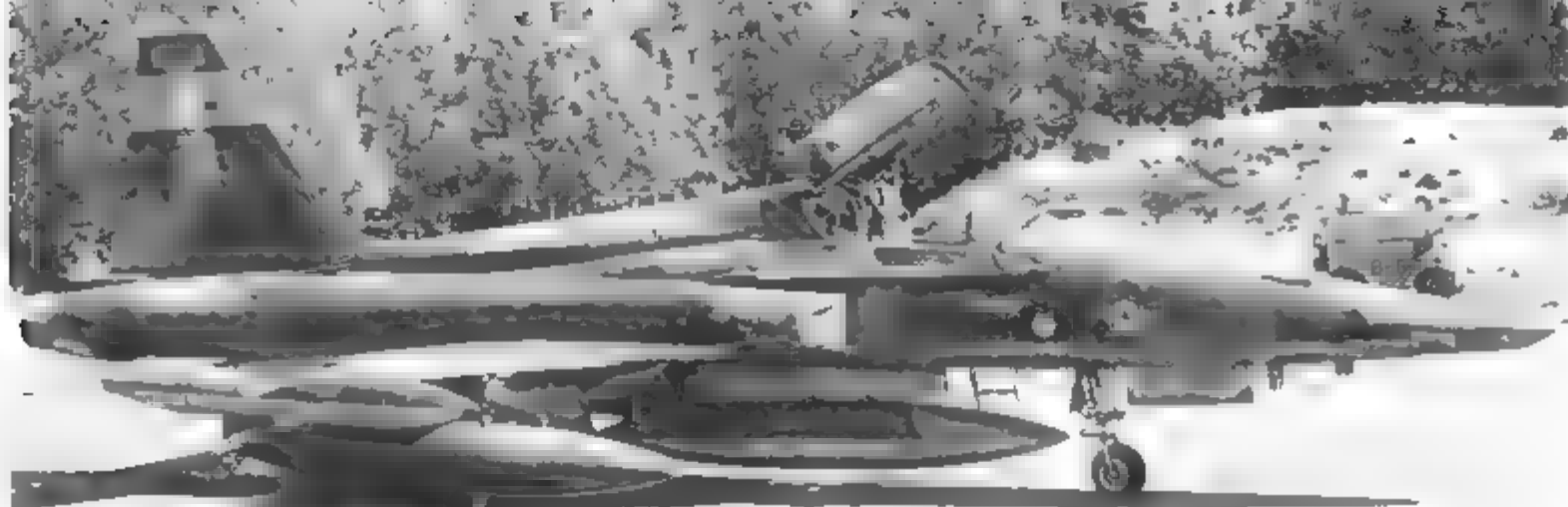
A CF-5A-R of 434 Squadron at Rygge, Norway in May 1978, during the reconnaissance competition 'Best Focus' (Michel C. Klaver)

A CF-5A-R of 434 Squadron at Cold Lake CFB Alberta, June 1978. (Doug Slowiak)

## Two-position Nose Strut



A Canadian CF-5B of 419 Squadron, Cold Lake CFB, Alberta, June 1978. Canada has painted some of their F-5s in "aggressor" paint schemes, and is using them to conduct air combat training. (Doug Slowiak)





F-5As of the "Jokers" Aerobatic Team of the Royal Norwegian Air Force. (Michel C. Klaver)

An F-5A-30-NO of 332 Squadron, RAAF. The axe is black with blue-edged blade, outlined in white. (D. Hughes via Doug Slowiak)

F-5A-35 NO of 334 Squadron, Royal Norwegian Air Force, during a 1969 visit to RAF Finningley, England. (C.P. Russell-Smith via Norm Taylor)

Norway received a total of 94 F-5As and 14 F-5Bs, all built by Canadair as NFs. They were operated by 336 and 332 Squadrons from Rygge, by 335 Squadron from Orland, and 334 Squadron from Bodo, all of which converted from the F-86F. By 1972, abnormally high rates of attrition had forced the Konge lge Norske Luftforsvaret to consolidate its F-5s into two squadrons, 336 and 338. This consolidation was short-lived though, and the RAAF now has the following squadrons operating the F-5:  
 332 Squadron at Rygge (F-5A)  
 334 Squadron at Bodo (F-5A)  
 336 Squadron at Rygge (F-5A)  
 338 Squadron at Orland (F-5A)  
 717 Squadron at Rygge (RF-5A)  
 718 Squadron at Sola (F-5B)  
 (This is the operational training unit.)  
 (C.P. Russell-Smith via Norm Taylor)



# Dutch F-5s

The Royal Netherlands Air Force, or Koninklijke Nederlandse Luchtmacht (KLu) conducted an extensive evaluation of all possible replacements for its T-33s and F-84s in 1966. They finally settled on an improved version of the F-5, to be designated NF-5. A letter of intent to purchase 75 As and 30 Bs was signed on January 30, 1967. The acquisition of the F-5 was accomplished under a cooperative manufacturing agreement between Canadair in Montreal and Fokker VFW and Avio Diepen facility at Ypenburg. The latter manufactured fuselage assemblies, and the final assembly was done by the former.

The NF-5 is an improved version of the CF-5. Improvements included in the NF-5 are: 1. Electrically-actuated doors to increase mass airflow for take-off. 2. A strengthened wing. 3. Maneuvering flaps. 4. Provision for larger external wing tanks. 5. Ejector bomb racks. 6. A strengthened and electrically heated windscreen. 7. Doppler radar navigation system. 8. An attitude heading and reference system. 9. Emergency UHF radio. 10. Radar altimeter.

The first NF-5 was rolled out by Canadair on March 5, 1969. One of the first problems faced by the KLu was how to get their NF-5s from Canada to the Netherlands. Since the NF-5 is not equipped with in-flight refueling, a complicated ferry flight program was worked out. Dubbed "H fite", the trans-Atlantic ferry flight operation involved staging out of Goose Bay, Labrador, on to Sondrestrom, Greenland, then to Keflavik, Iceland, then to Lossiemouth, in Scotland, and finally to Twenthe AB in the Netherlands. These flights were supported by the USAF's 2nd Aircraft Delivery Group, which provided operational briefings, and C-130 airborne navigational aircraft, which circled at pre-determined points, mid-Atlantic, to provide fixes and, if needed, air-sea rescue services. The first four NF-5s, all B models, arrived at Twenthe on November 19, 1969.

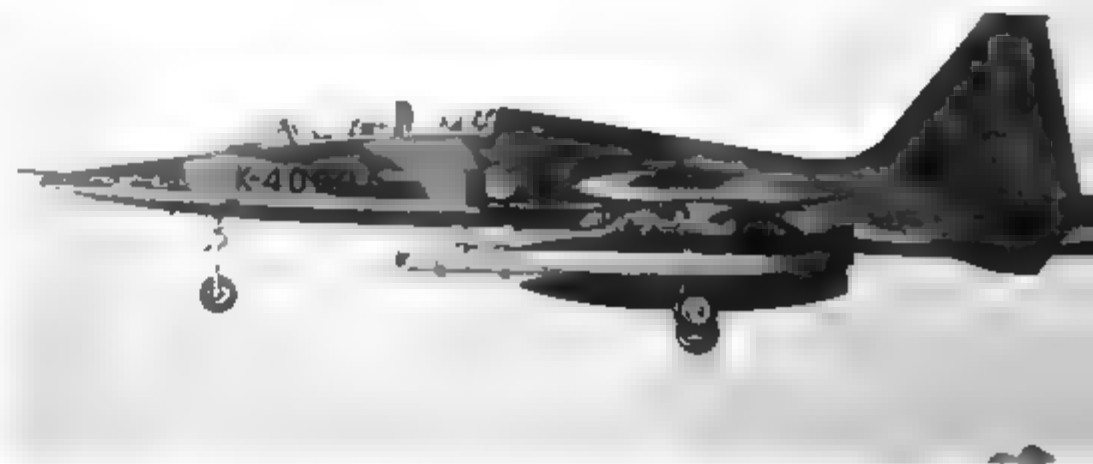
The first KLu squadron of the Tacical Air Command (Commando Taktische Luchtmacht) to receive the NF-5 was No. 315 at Twenthe, in May 1970. Following this, No. 314 at Eindhoven and No. 316, also at Eindhoven, traded in their F-84Fs for the NF-5.

A pristine NF-5A is rolled out of the factory. The Dutch operate four squadrons of NF-5s. They are:

- 313 Squadron at Twenthe
- 314 Squadron at Eindhoven
- 315 Squadron at Twenthe
- 316 Squadron at Gilze Rijen

An NF-5B of 313 Squadron landing at Twenthe. It carries a practice bomb dispenser on the centerline station. (Michel C. Klaver)

An NF-5A of the KLu Operational Conversion Unit during a visit to RAF North Weald, England, May 1970. (D Hughes via Norman E. Taylor)



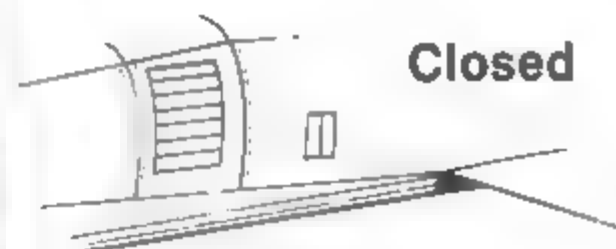
An NF-5A of the KLu 315 Squadron at Twente. The squadron badge on the tail is a yellow lion's head on a blue circle. (Michel C. Klaver)



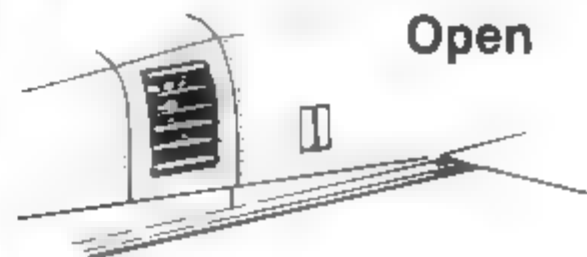
An NF 5A of 316 Squadron in the latest configuration. (Michel C. Klaver)



## NF-5 Air Doors



**Closed**



**Open**



An NF 5B of 314 Squadron. The squadron badge on the tail is a golden centaur on a red circle. This aircraft was "zapped" with an RAF Jaguar unit badge (on the fuselage) during a visit to RAF Mildenhall. (Michel C. Klaver)

# F-5E "Tiger II"

When the F-5A was designed, the Air Force was not interested in optimizing it for the air-to-air role. It was envisioned as a ground attack aircraft with only limited air-to-air capability. There was no provision for radar or a lead-computing gunsight and, with a top speed of only Mach 1.4, it was felt that the F-5A would not be able to compete in the modern air combat arena.

As newer and more powerful versions of the J-85 engine were developed, and the F-5A's performance figures improved correspondingly, some people began to change their views on mission capabilities of the F-5. The new engines would not make the F-5 a mach 2 airplane, but then, data being accumulated as a result of air wars in the Middle East and Vietnam showed that the majority of air-to-air engagements degenerated to high subsonic speeds very quickly, regardless of what the initial encounter speeds were. In that regime, a lightweight fighter with good initial and sustained turning capabilities had an advantage over a larger, more sophisticated adversary.

When General Electric came up with the dash 21 version of the J-85, they requested the loan of an F-5 for installation of the new powerplants. In the fall of 1968, F-5B 63-8445 was sent to Edwards AFB for modification with the new engines.

In January of 1969, the Air Force decided to fund early development costs for a follow-on version of the F-5A. It was initially designated the F-521 in deference to the new engines. The Air Force decision was based upon development of the F-5 into an air superiority fighter. This was to open new vistas in the F-5 marketing program, as the F-5A production line was in danger of being shut down in the early 70s.

GE successfully completed a 130-hour flight test program with the dash 21 powered F-5B in 1969, and began model qualification tests the following year. In the meantime, features of the F-5E were being delineated, and the following changes from the basic F-5A design emerged:

- Integrated fire control radar system and lead-computing gunsight. This system was designed to provide target detection and range tracking, lead computation for the twin M-39 20mm cannon that were retained in the nose, in-range envelope computation for the two wing-tip mounted AIM-9 Sidewinder missiles, and a roll-stabilized aiming reference for the use of guns, bombs and rockets in air-to-ground delivery.
- The fuselage was lengthened 15" and widened 16" to accommodate the larger 21 engines, which added a ninth compressor stage and increased airflow from 44 pounds per second to 52 pounds per second.
- Increased internal fuel capacity. This was an added bonus of the lengthened fuselage, and resulted in additional 570 pounds of fuel. All internal fuel in the F-5 is carried in the fuselage, and the new tanks were to have reticulated foam to decrease the Tiger's vulnerability to cannon fire.
- Increased wing area and addition of maneuvering flap system. The increased wing area totaled 16 square feet, a good portion of which was accounted for by redesigning the inboard leading edge extension of the wings. The maneuvering flap system had been designed by Northrop for Dutch use in their NF-5s, and could be readily adapted to the F-5E.

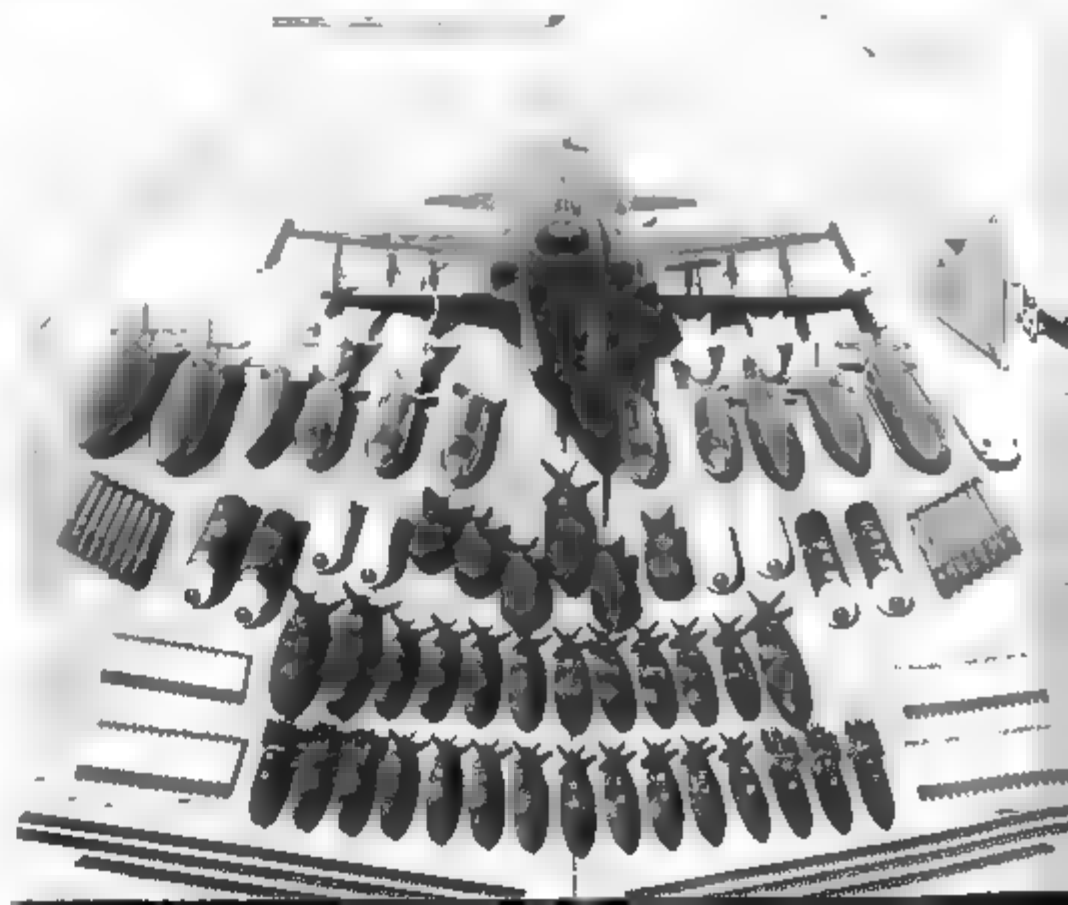
- Two position nose gear, which could raise the nose of the aircraft 3 degrees for increased angle of attack in takeoff. This feature had been developed for Canadian and Dutch F-5s and, coupled with the new engines, was expected to increase takeoff performance by 30%.
- A JATO system and arresting hook, for use on short runways, both of which had been developed for Norwegian F-5s.

Even with all of the above changes, Northrop engineers estimated that the F-5E would retain 75% commonality of tooling masters, and the Air Force estimate for spare parts commonality and ground support equipment commonality ran 40% and 70%, respectively.

Rollout of the first F-5E was June 23, 1972, with the first flight on the following August 11th. First deliveries of production aircraft were made the following spring to the 425th TFS, which was assigned responsibility for training pilots of foreign customers.

In 1976 the 3,000th example of the T-38/F-5 series was delivered. When asked about plans for advanced versions of the F-5 series, W. E. Gasch, now Vice President of Northrop's aircraft group, said that present and potential customers for the F-5 were well satisfied with the existing airframe-engine package, and that they would prefer to see additional developmental efforts directed towards avionics packages that could take advantage of 'smart weapons.' He also voiced his expectation of F-5 production through 1987.

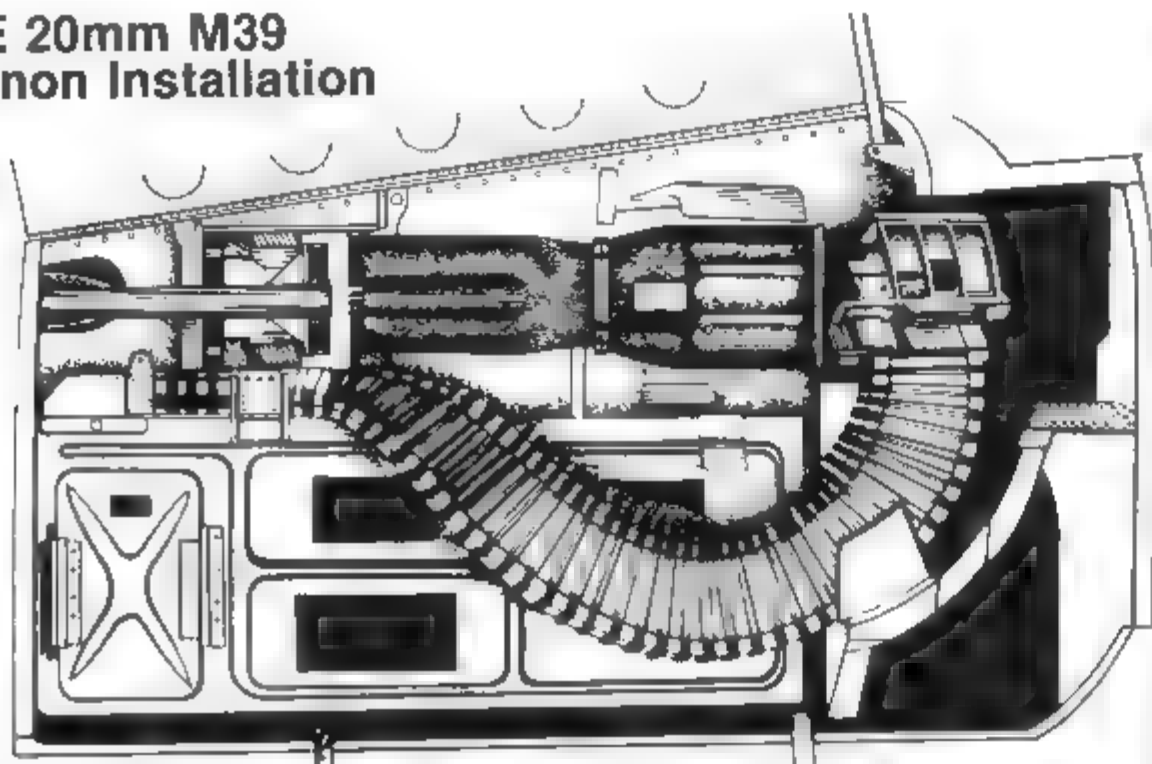
The first F-5E posed with the wide variety of the ordnance it is capable of carrying. (Northrop)





The cockpit of the F-5E 'Tiger II'. The flight instruments are grouped on the left side of the panel, while the engine instruments are on the right. Scope for F-5E's radar is in the center, with gunsight controls above, and communications controls below. (Northrop)

## F-5E 20mm M39 Cannon Installation



The first USAF unit to receive the F-5E was the 425th TFS, whose aircraft carried broad yellow bands edged in black on the fuselage and vertical fin. (Geer)



# F-5E "Tiger II"

## Dimensions

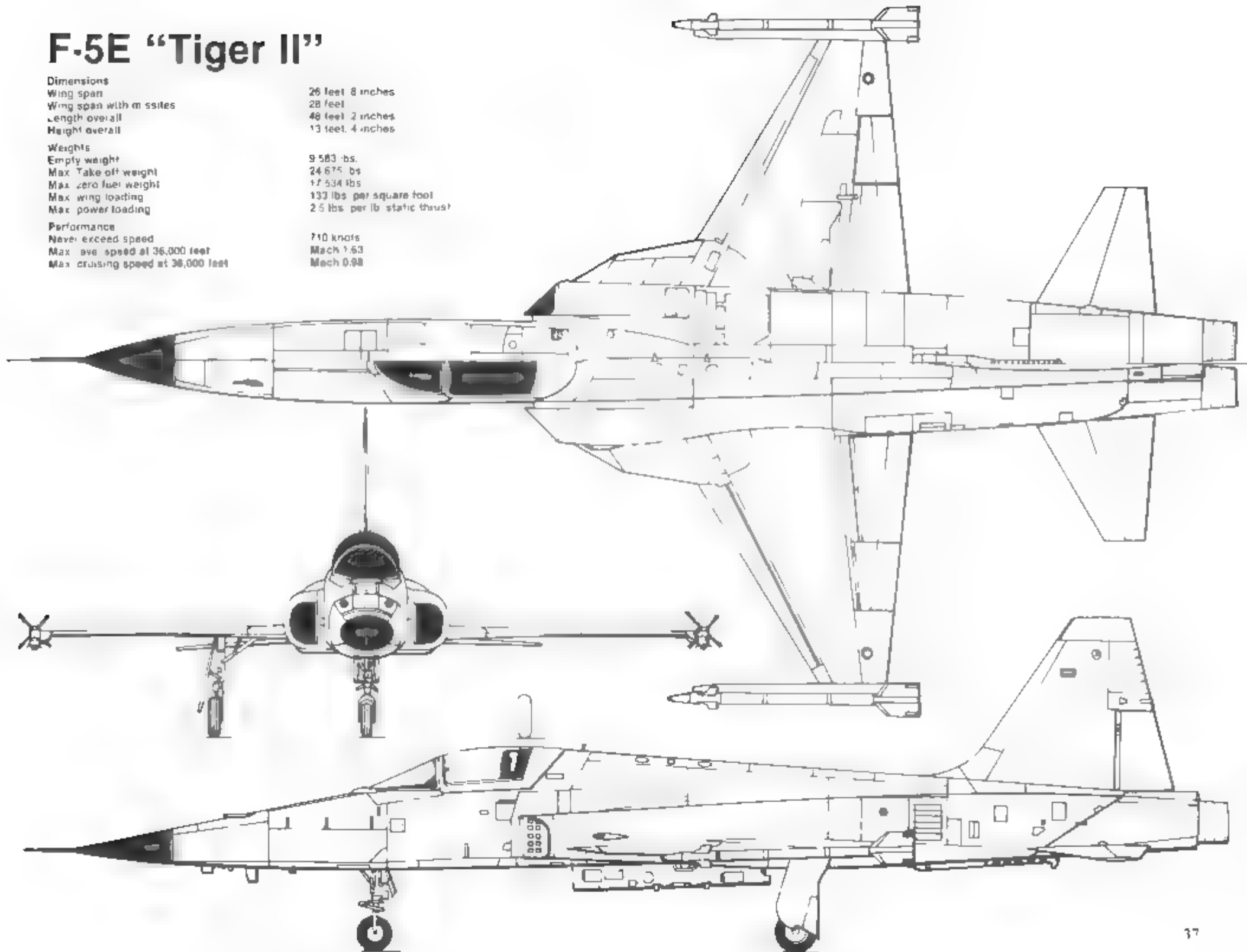
Wing span	26 feet 8 inches
Wing span with missiles	28 feet
Length overall	48 feet 2 inches
Height overall	13 feet 4 inches

## Weights

Empty weight	9,583 lbs.
Max. Take-off weight	24,675 lbs.
Max. zero fuel weight	17,534 lbs.
Max. wing loading	133 lbs. per square foot
Max. power loading	2.5 lbs. per lb. static thrust

## Performance

Never exceed speed	710 knots
Max. sea speed at 36,000 feet	Mach 1.63
Max. cruising speed at 36,000 feet	Mach 0.98





Like the F-5B, the F-5F is a 2-seat advanced trainer/attack version of the basic single seat fighter. Based on the F-5E, the F-5F has all the offensive weapons delivery systems of the fighter and even retains the two 20mm guns in a lengthened nose section. The F-5F can allow the use of the rear seat for an observer/radar operator or weapons officer and some aircraft have had the rear seat position used for laser designators and other advanced electronics packages. (Northrop)



The first F-5F was used as a company demonstrator, hence the distinctive three-tone gray camouflage, twin tigers, company name and flags of customer countries. The large "43" on rear fuselage is an air-show identifier. (Northrop)

F-5E of the 58th Tactical Fighter Training Wing, Luke AFB, Arizona, carries a wing badge on nose, blue bands on the vertical fin and canopy rails, and standard USAF camouflage. (Douglas Slowak)

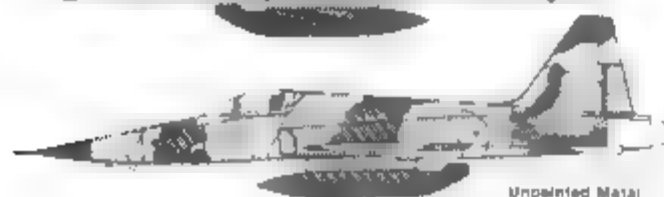
## US Navy Special

### Scheme 1

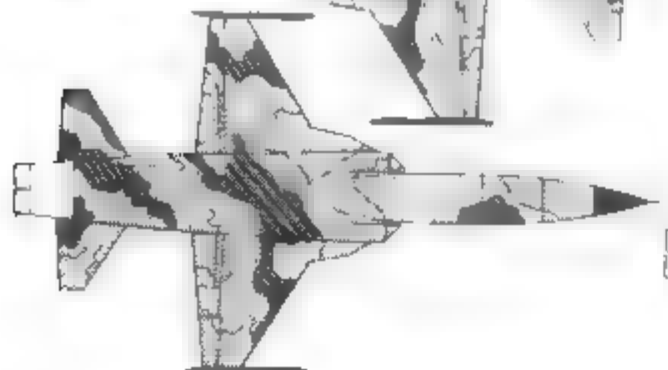
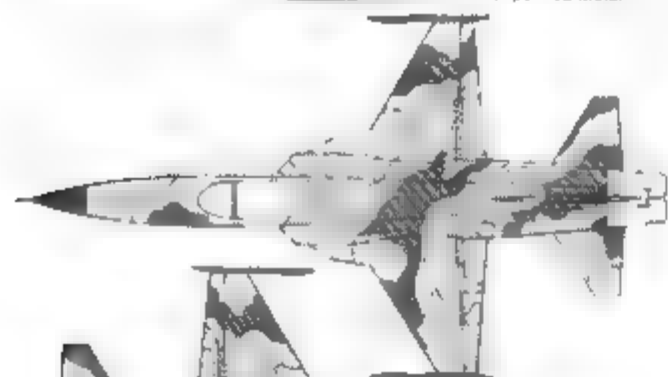
	35184
	Blue
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	Blue
	35414
	Blue

### Scheme 2





	36251
	Gray
	35237
	Blue
	36307
	Gray



Unpainted Metal

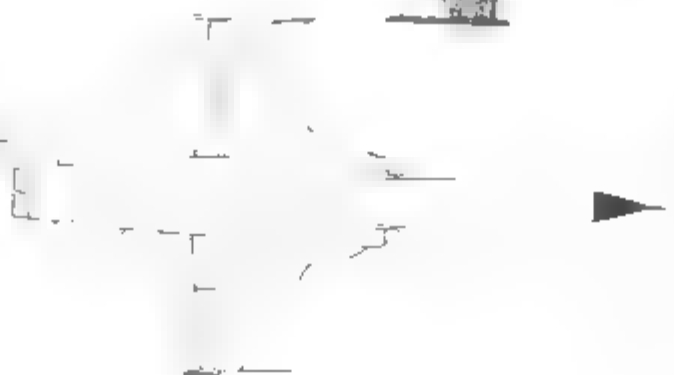
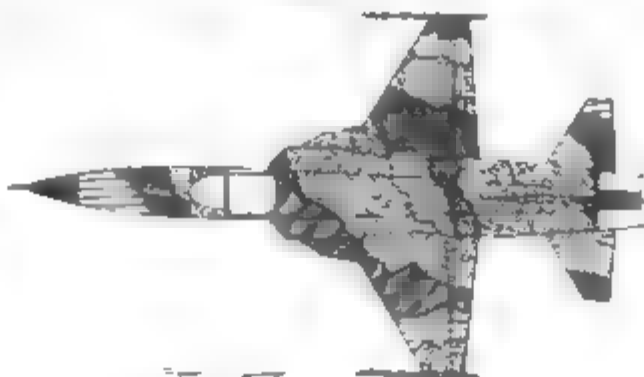


## USAF Aggressor 'Ghost'

	35217
	Blue
	36251
	Gray
	36307
	Gray
	35622
	Blue

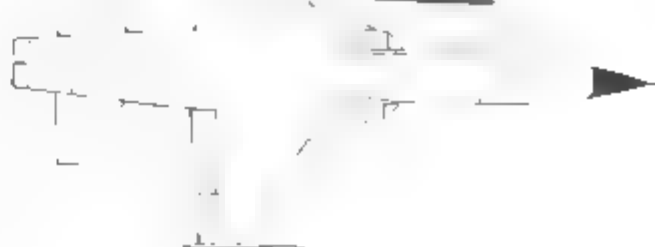
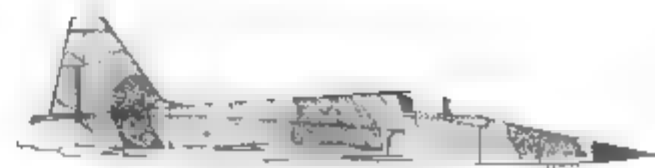


Unpainted Metal



## USAF Aggressor 'Grape'

	35414
	Blue
	35109
	Blue
	35184
	Blue
	35622
	Blue



Unpainted Metal

In June 1973 the first ten F-5Es were delivered to the 425th TFS at Williams AFB Arizona. These would be used to train foreign customers and would be placed in the operational inventory once the user countries began receiving their F-5 models later that year.

In the meantime, the Air Force had decided to initiate a program similar to the Navy's 'Top Gun' dissimilar air combat training program. The Air Force's first 'aggressor' squadron was the 64th Fighter Weapons Squadron, activated at Nellis AFB Nevada in June 1973. The Air Force program went the Navy one better. USAF Aggressors use Soviet tactics, and they try to think and fly like MiG drivers. Both the Navy and USAF used the T-38 as a MiG-21 simulator until F-5Es and F-6s were made available to them.

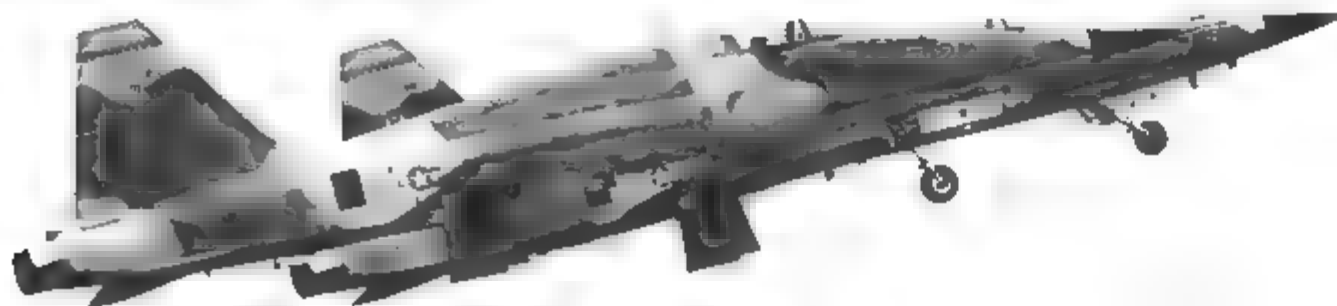
The first F-5Es for USAF Aggressor squadrons were 71 Tiger IIs which had been ordered by DOD for supply to the VNAF in 1974. When cuts in the defense appropriations for aid to South Vietnam were made in the fiscal 1975 budget, 71 of the 125 Tiger IIs ordered became Aggressor aircraft. The untimely demise of South Vietnam forced permanent cancellation of deliveries. The USAF eventually formed four Aggressor Squadrons, the 64th and 65th FWs at Nellis, the 26th TFS at Clark AB, Philippines, and the 527th TFTAS at RAF Coningsby, England. All are now equipped with the F-5E, and U.S. Navy Fighter Weapons School 'Top Gun' is also equipped with the F-5E and F-6.



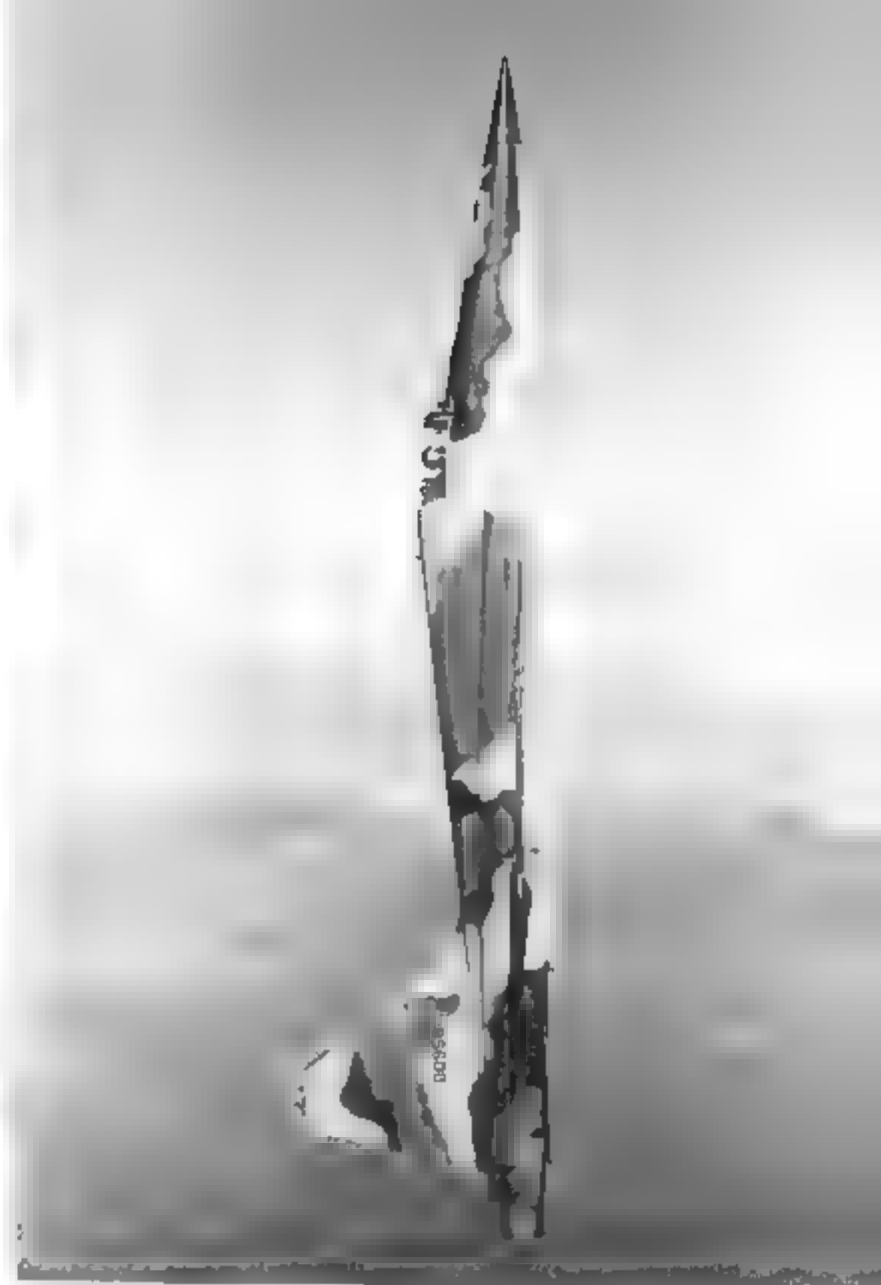
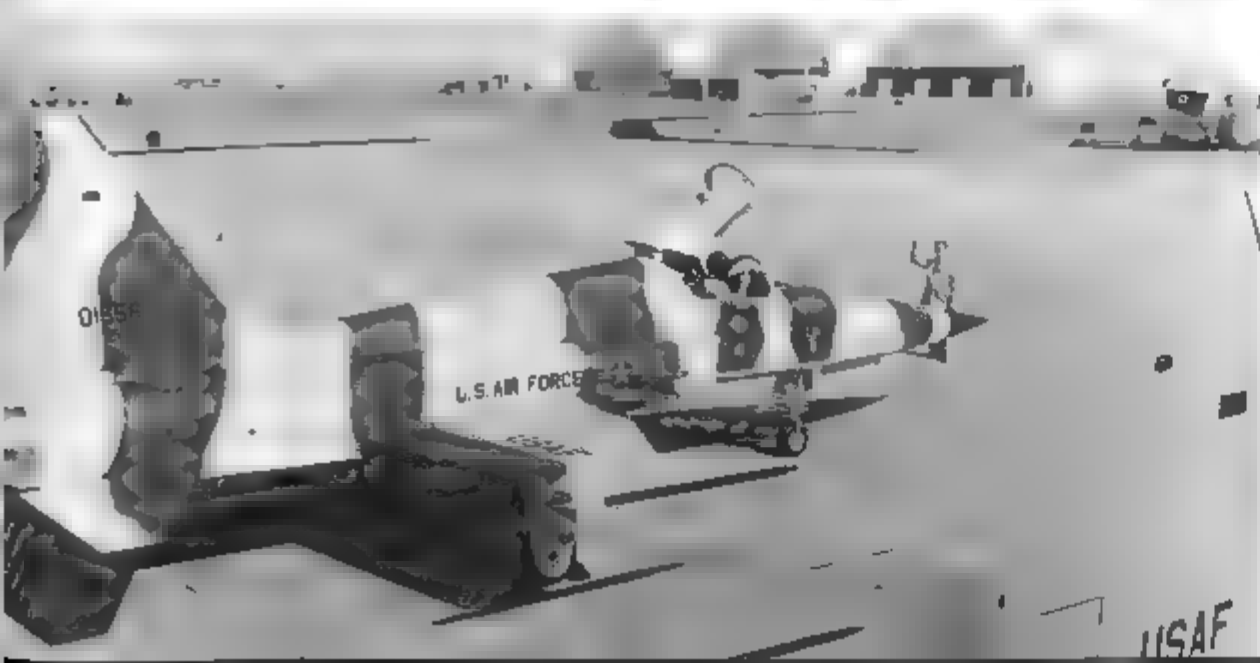
The "Eight Pack" method of delivering F-5s (eight at a time) in C-5 Galaxies was first employed to ship 527th TFTAS aircraft to England. It proved so efficient that all foreign deliveries will be made in this way in the future. (USAF)



An F-5E of Nellis' Aggressor Squadron in 'Ghost' camouflage. (Lou Drendel)



A pair of Nellis-based Aggressors make a formation departure from the Des Moines Air National Guard open house, May 20, 1978. (Charles B. Mayer)



(Above left and left) Two views of a brand-new F-5E during factory testing. This aircraft, painted in "Lizard" Aggressor camouflage, is destined for assignment to the 527th TFTAS, RAF Alconbury. The white lines on the fin trailing edge are TACAN and IFF antennas. (Northrop)

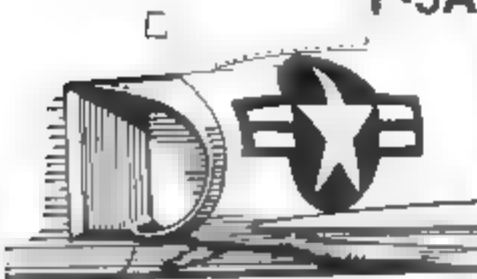
A Tiger II demonstrates its power and agility in a vertical climb. The blade antenna under nose for UHF/IFF (rear) and TACAN (forward). (Northrop)



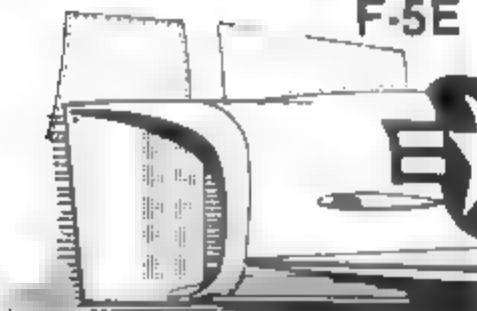
The Top Gun F-5E assigned to Winston "Mad Dog" Copeland carries his MIG Kill marking under the cockpit. (Fred Roos via Norman E Taylor)

## Air Intake Development

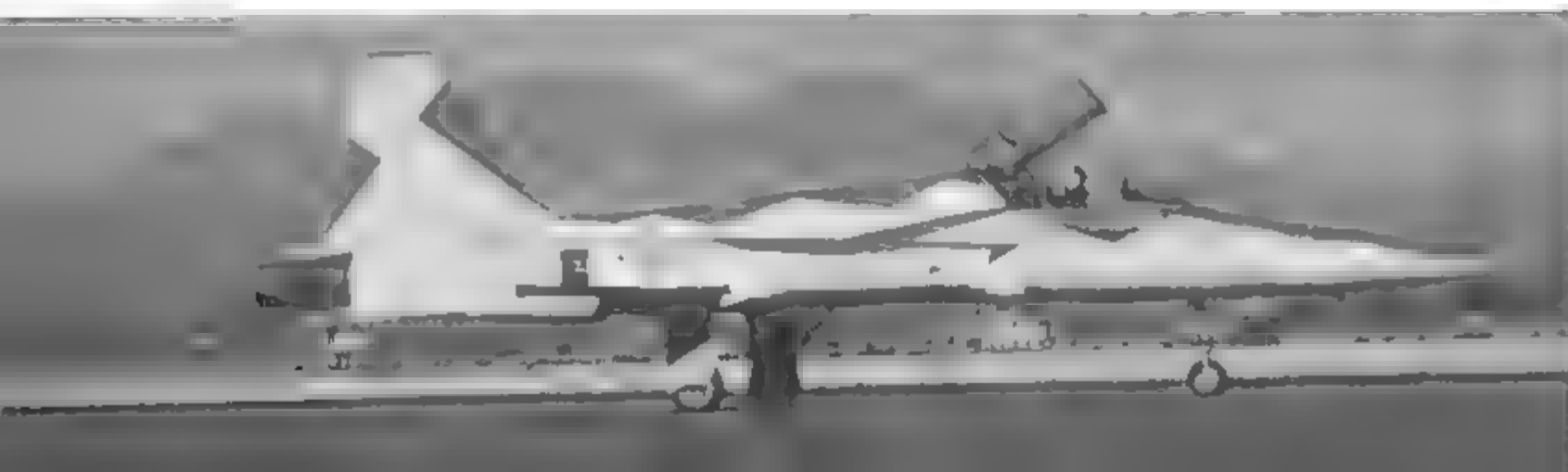
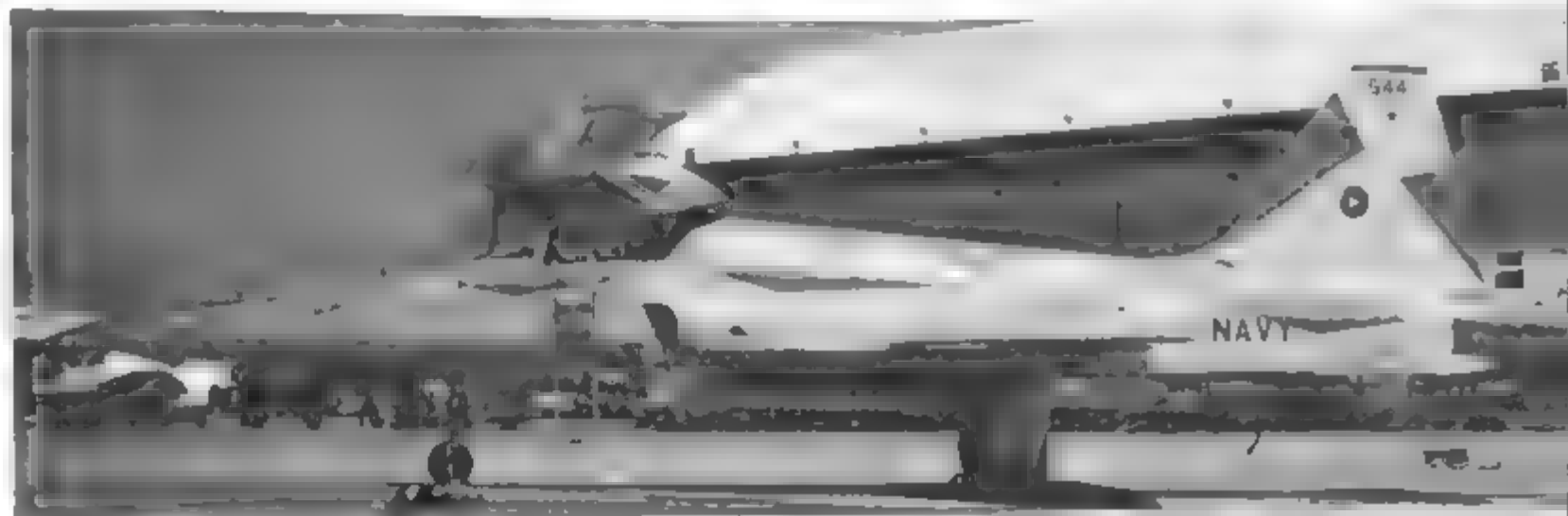
F-5A



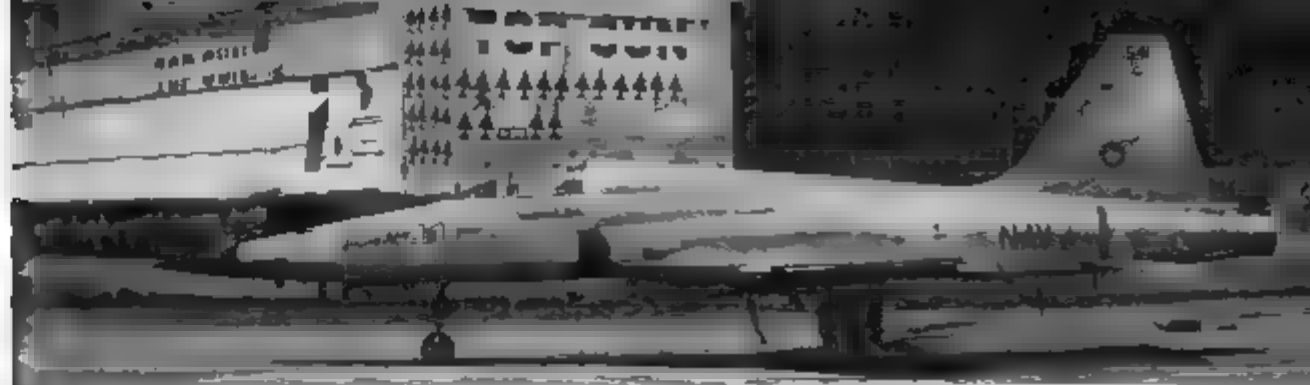
F-5E



A Top Gun F-5E in the Ferris splinter scheme. The Navy applied this scheme on an experimental basis, and has been sued by the artist for infringement of his copyright on the scheme. (Don Logan)



A Nellis AFB based USAF F-5E Aggressor in the Ferris splinter scheme designed for the F-38 and F-5 series. This variation uses three colors - a light base with light-medium gray and dark gray over it. (Don Logan)

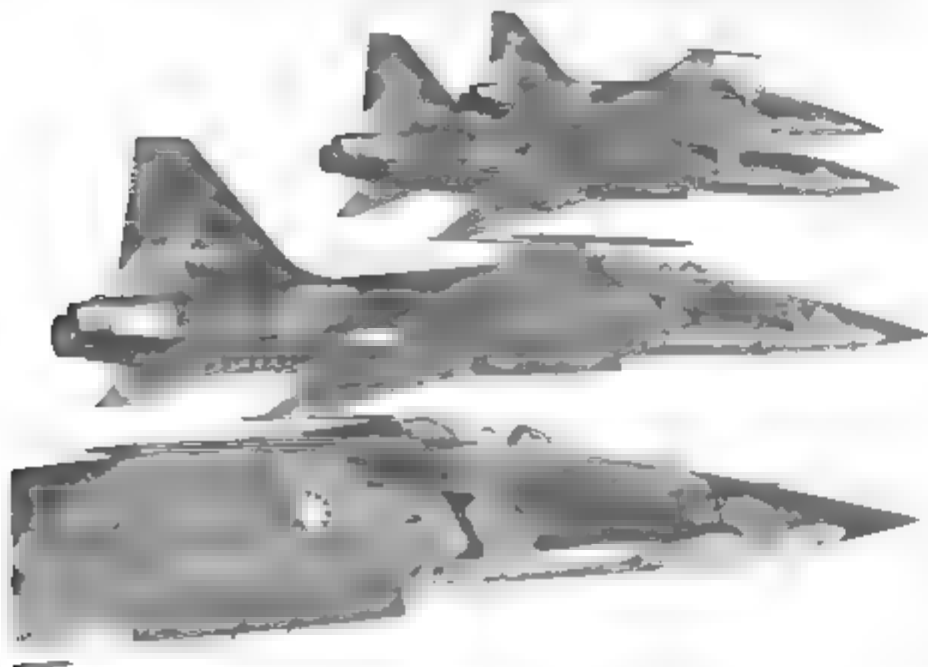


Some Navy F-5s have their camouflage patterns carried on the undersides of the aircraft. (Northrop)

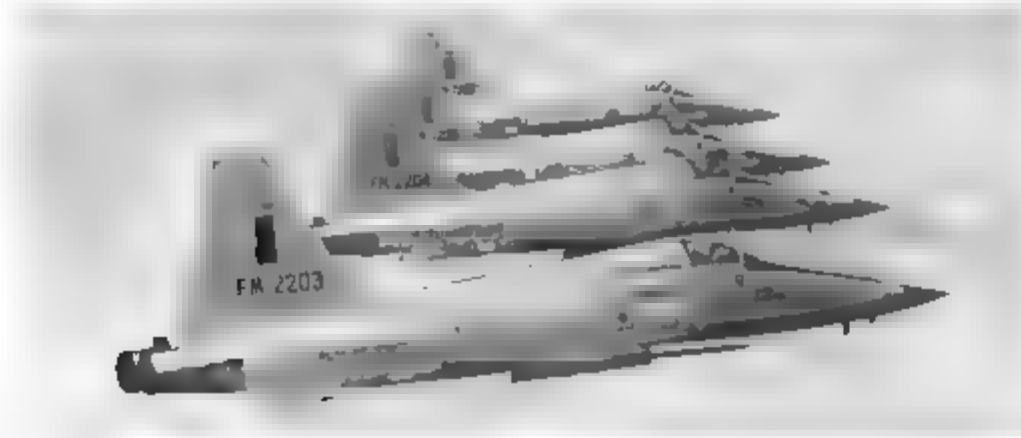
A Top Gun F-5E in a Navy camouflage scheme known unofficially as "glop" (Don Logan)

A Top Gun F-5F at Miramar NAS, December 3, 1977 (Shinichi Ohtaki)

Another view of F-5E number one. Having survived the test program, it was assigned to the 425th TFS, and made the airshow circuit. Shown here at Fargo, North Dakota, June 25, 1977 (Charles B. Mayer)

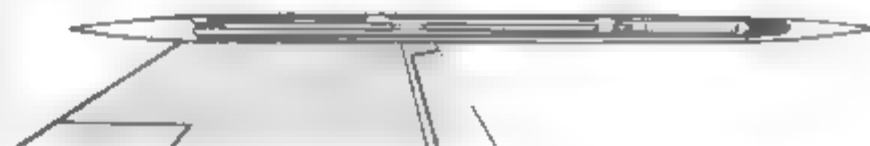


A flight of CNAF F-5Es over Taiwan. These aircraft are largely manufactured by the Aero Industry Development Center in Taichung. The F-5E is vastly superior to any of the fighters available to the Communist Chinese air forces on the mainland, the Shenyang F-6 or F-9 (MIG-19). As a result, the mainland government has offered a reward of 770 pounds of gold to any CNAF pilot who defects to the mainland in an F-5E. (This was over \$2.5 million at the time the offer was first announced, which is the approximate cost of an F-5E. Today's price of gold would make the offer add up to over \$6 million.) To improve their Air Force's capabilities, the Nationalist government requested a replacement for their aged F-104s. Rejecting the IAI Kfir C-2 because of political consequences with the Arabs who supply Taiwan with oil and possible spares shortages, the Taiwan government requested F-4 Phantoms, even indicating a willingness to accept surplus F-4s from European nations replacing them. The US State Department rejected this proposal, suggesting that the F-5E be equipped with Sparrow missiles. Unfortunately, these would have so seriously degraded the F-5's performance that the Nationalists rejected the idea. Northrop countered with a new model, the F-5G. This aircraft retained most of the structure of the F-5E, but the two 5,000lbs J-85s were to be replaced by a single 18,000lbs F404 from the F-18A/L. The increase in thrust would increase performance some 60% in clean condition; even with Sparrows, the F-5G would have outperformed a clean F-5E by 10%. Though the Chinese were very interested, State killed this sale, claiming a policy of not supplying "more sophisticated weapons to areas of potential conflict." Instead, the State Department offered Taiwan 48 F-5Es equipped with the Hughes Maverick TV guided missile (certainly a sophisticated weapon, but apparently not quite as sophisticated as a single-engined F-5). At present, Taiwan plans to acquire a total of 180 F-5Es.

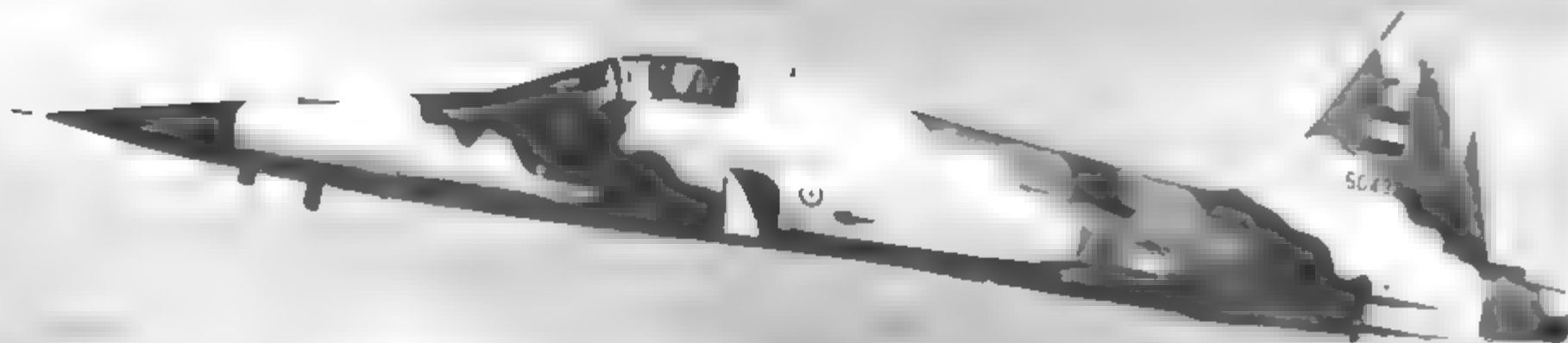


Malaysia has purchased 2 F-5Bs, and 14 F-5Es. They are finished in overall aluminum. (Northrop)

## F-5E Sidewinder Missile Launch Rail

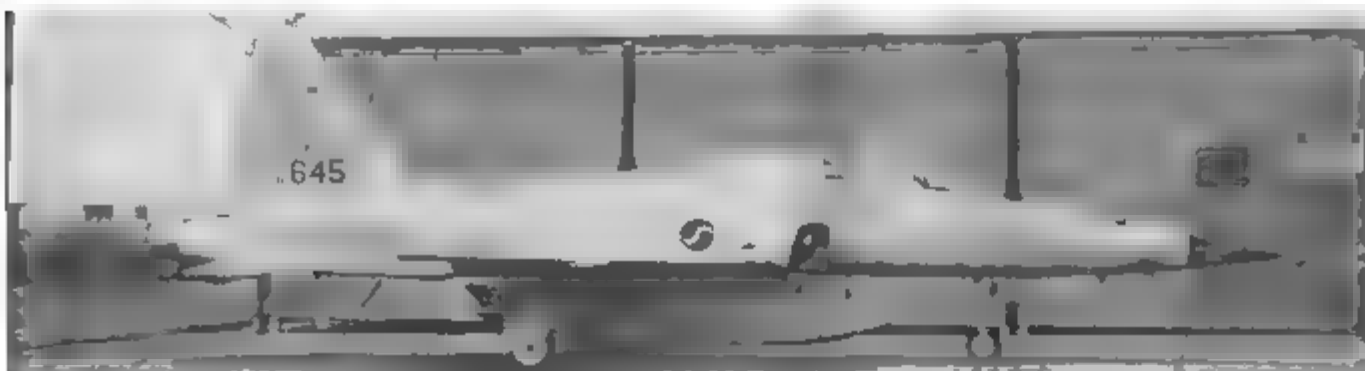


Jordan Acquired 30 F-5As and 4 F-5Bs from Iran, and later bought 44 F-5Es and 2 F-5Fs new. (Northrop)





A formation of ROKAF F-5Es in USAF three-tone camouflage. Korea has acquired 126 F-5Es and 9 F-5Fs. In an attempt to improve the combat capability of ROKAF units, Korea has requested a number of F-5G's. (previously proposed for the Taiwanese) The GAO is investigating the feasibility of producing this variant. If approved, the F-5G would provide an interim enhanced capability air combat fighter pending the ultimate acquisition of the export version of the F-16. (Northrop)



An F-5E of ROKAF in two-tone gray camouflage, which has gained world-wide popularity for all the air superiority role. (Don Logan)



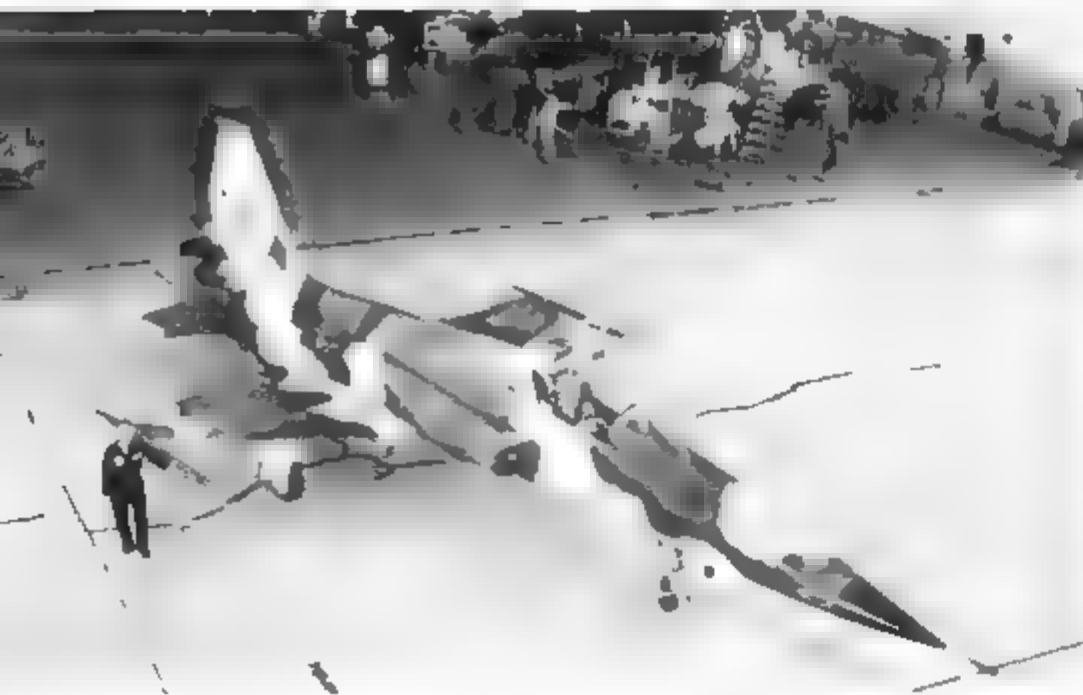
An ROKAF F-5B seen in the currently popular two-tone gray air superiority color scheme. Several air forces have adopted this camouflage for their F-5s. (Northrop)

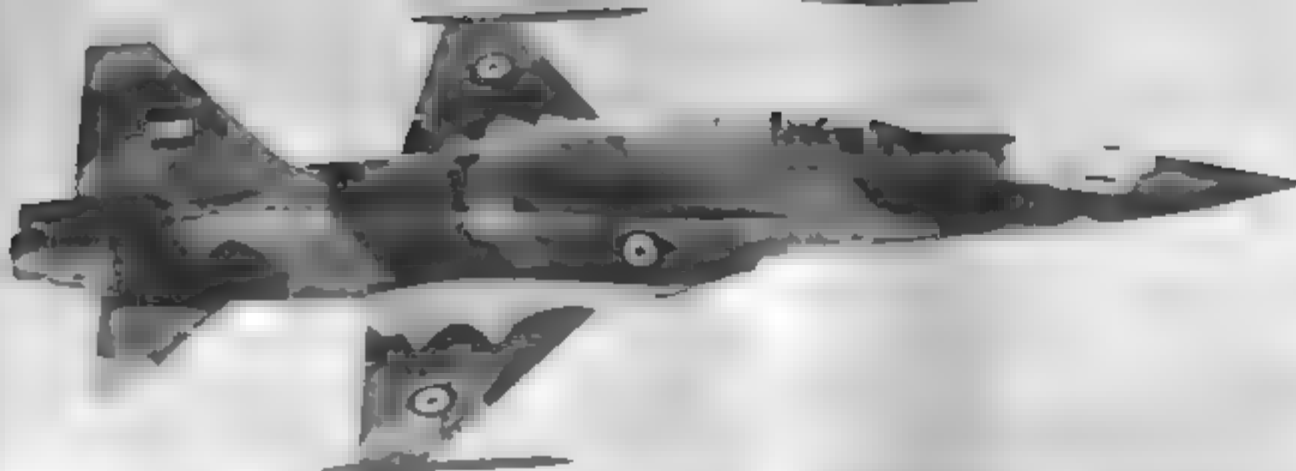


## F-5E Vertical Fins



RSAF F-5Es were outfitted with the Litton LN-33 inertial navigation system, in-flight refueling equipment and provision for attachment of a four-camera reconnaissance nose. In 1975 the Saudis signed a contract for purchase of an additional 40 Es, plus 20 Fs. They also funded research and development that would give their F-5s the capability to carry the Hughes AGM-65A Maverick and laser-guided smart bombs. During 1976, some RSAF F-5Es were based in Syria in support of Syrian troops on the Golan Heights and a detachment visited Jordan. The 3,000th F-5 to roll off the assembly line was one of 70 F-5Es for Saudi Arabia. (Northrop)

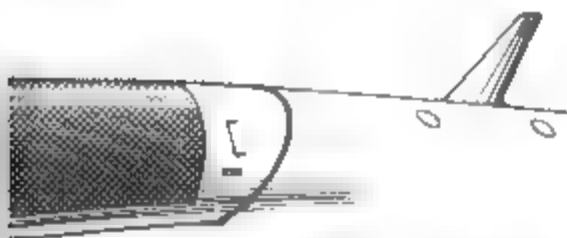




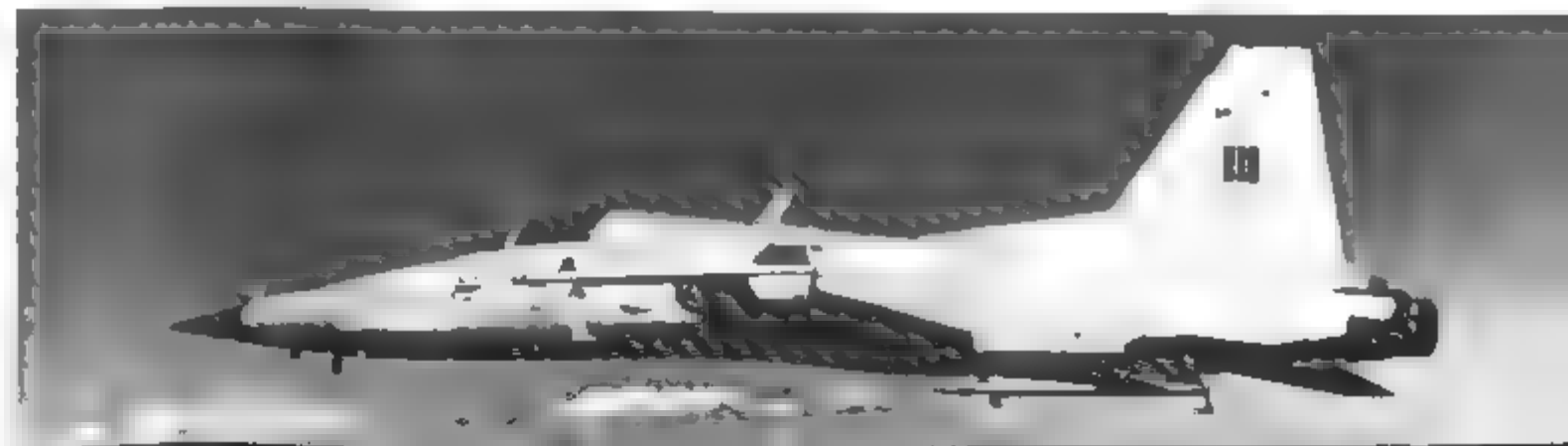
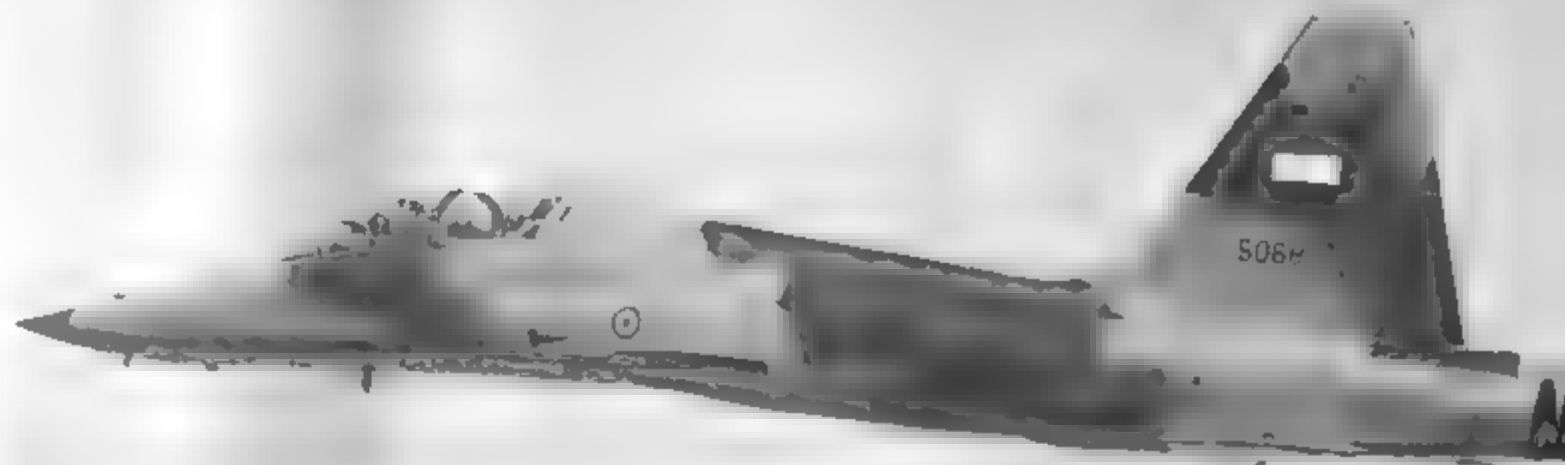
One of the 141 F-5Es ordered by Iran during its factory test flight. Iranian F-5Es are equipped with an inertial navigation system, as well as a weapons delivery system capable of generating altitude and velocity data for air-to-air ground delivery and a Martin-Baker ejection seat. Deliveries began in January 1974, at a unit cost of \$1.9 million. (Northrop)

First deliveries of Iran's 28 F-5Es began in August 1975. The F-5As transferred from Iran to South Vietnam were eventually traded in on F-5Es by the VNAF; the IIAF had no desire to re-acquire the F-5As, which were then taken back by JSAF MAP to be used as spares for MAP countries still using the F-5A. Until the Iranian Revolution, the IAF had hoped to supplement its F-5s with the F-16 and F-16L. (Northrop)

## F-5E ILS Blade Antenna



In order to enable Kenya to match defense capability with its Soviet supplied African neighbors, the U.S. Government granted a five million dollar credit. Originally, it was expected that Kenya would use the credit to purchase surplus Iranian F-5As and Bs. However Kenya eventually purchased 10 F-5Es, and 2 F-5Fs, at a cost of approximately 75 million dollars! Kenyan F-5s are finished in the two tone gray air superiority camouflage. (Northrop)







In late 1967 the U.S. State Department authorized sale of F-5s to Brazil in reaction to the French sale of Mirages. In 1968 Brazil announced that it would acquire both aircraft, the Mirages for air superiority, and the F-5s for light strike duties. Sale of F-5s languished with the U.S. reluctance to sell modern fighters to South American countries. The Força Aerea Brasileira maintained their interest in the F-5 though, and in 1973 negotiations for purchase of F-5Es got underway. In October 1974 the Brazilian government signed a 72 million dollar contract covering purchase of 36 F-5Es and 6 F-5Bs. (Northrop)



## Air Superiority Gray Scheme

Chile  
Korea  
China  
Kenya  
Switzerland



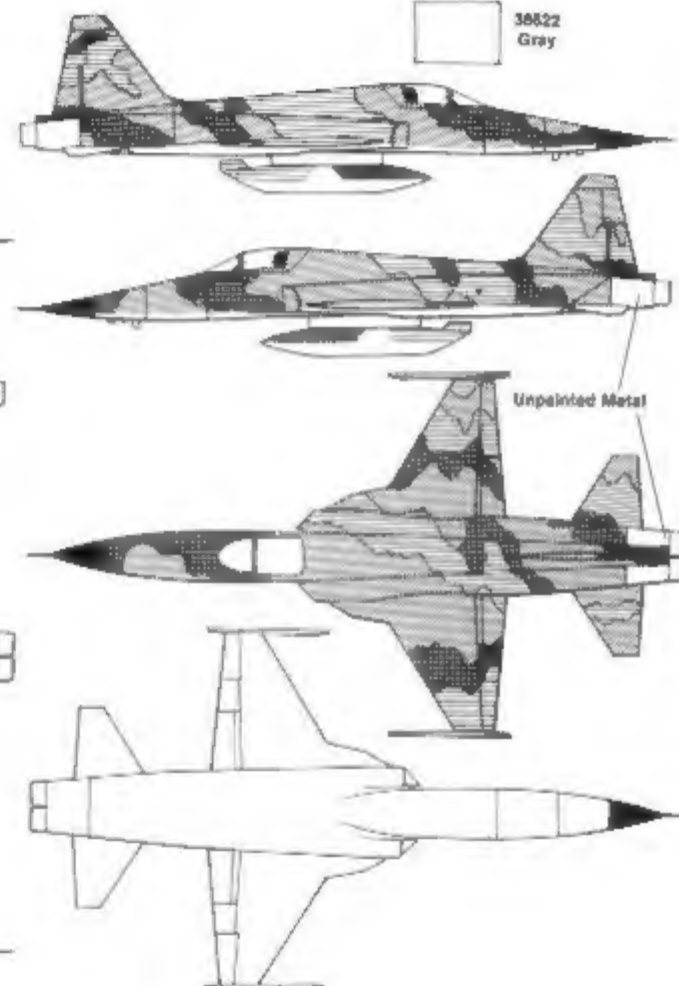
## USAF Standard Camouflage

USAF  
Korea  
China  
Brazil  
Vietnam



## Desert Camouflage

Iran  
Jordan  
Ethiopia  
Saudi Arabia





Chile first expressed interest in the F-5 back in 1967, but the U.S. Government embargoed sale of any F-5s to Latin America. In their stead, Chile bought refurbished Hunters from Britain. With the rise to power of Marxist President Allende, the Soviet Union pressed for sale of MIG-21s but the head of the Fuerza Aerea de Chile (FAC), Gen de Brigada Aerea Don Gabriel van Schowen Figueroa, was opposed, stating his preference for F-5Es. The U.S. was unwilling to sell any military equipment to the leftist Allende government. Fear of losing South American markets to the Soviets eventually led to the authorization of the sale of F-5Es to Chile, Argentina, Brazil, Colombia and Venezuela in 1973. Deliveries of Chile's 15 F-5Es and 3 F-5Fs began in June 1976.



These two photos of Chilean F-5s, an F-5E above and the F-5F below, show the new dorsal fin extension and the ILS blade antenna on the fuselage spine. The F-5F shot also shows the extended nose which allowed retention of the two 20mm M39 cannons. (Northrop and Don Logan)

In 1974 Defense Minister Rudolf Gnsegi, of Switzerland, recommended purchase of 90 F-5Es, to replace obsolescent Hunters of the Flugwaffe. The Swiss Government requested formal letters of offer from U.S. DOD, covering a total of 126 F-5Es and 14 F-5Fs, with the understanding that Switzerland would participate in manufacture of the fighters. This was followed by a six week flight evaluation of the F-5s, in which they competed in air combat against Hunters and Mirages. The F-5 was the winner, and preliminary negotiations for a contract specified that Swiss F-5s would include changes in the flaps and ILS equipment to permit steeper approaches, and a strengthening of the airframe to permit fully loaded aircraft to be hoisted into cavern-hanger roofs. The Flugwaffe finally settled on changes only to the wheels and brakes (larger) and to the oxygen system (from liquid to gaseous). Switzerland will acquire 66 F-5Es and 6 F-5Fs. (Northrop)







F-5E of the 54th FTS,  
57th FW, Nellis AFB,  
Nevada, in the "Ghost"  
camouflage scheme.  
"Ghost" is the most ef-  
fective of the "Ag-  
gressor" schemes.



F-5A of the 6th TFS,  
Philippine Air Force,  
Clark AFB, Philippines.